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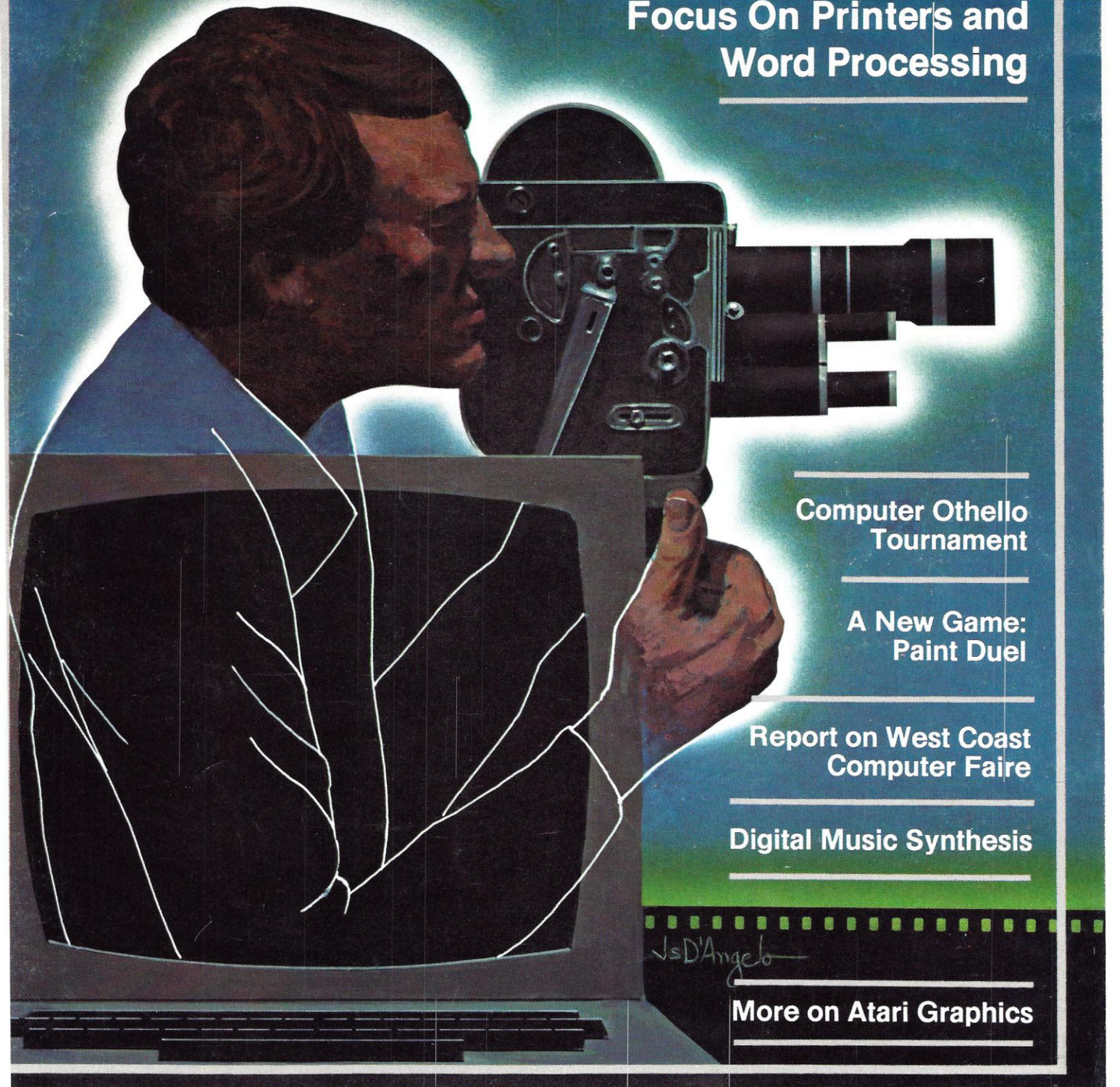

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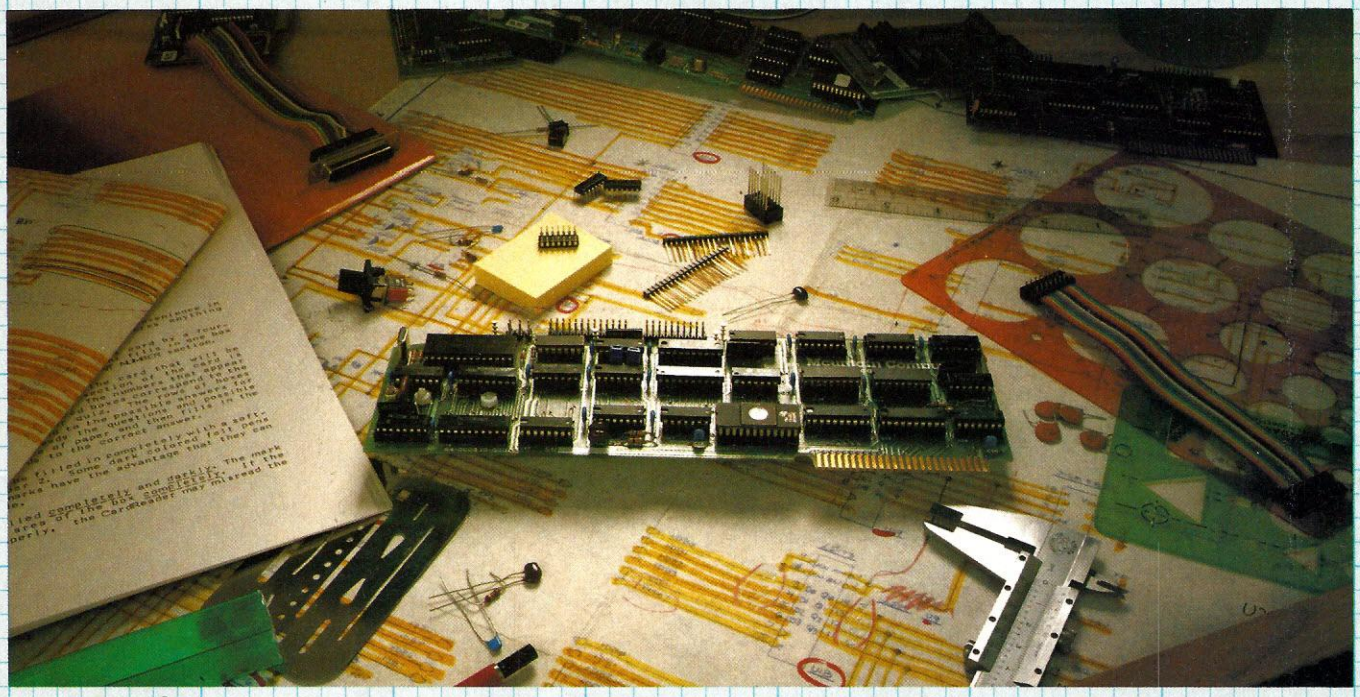

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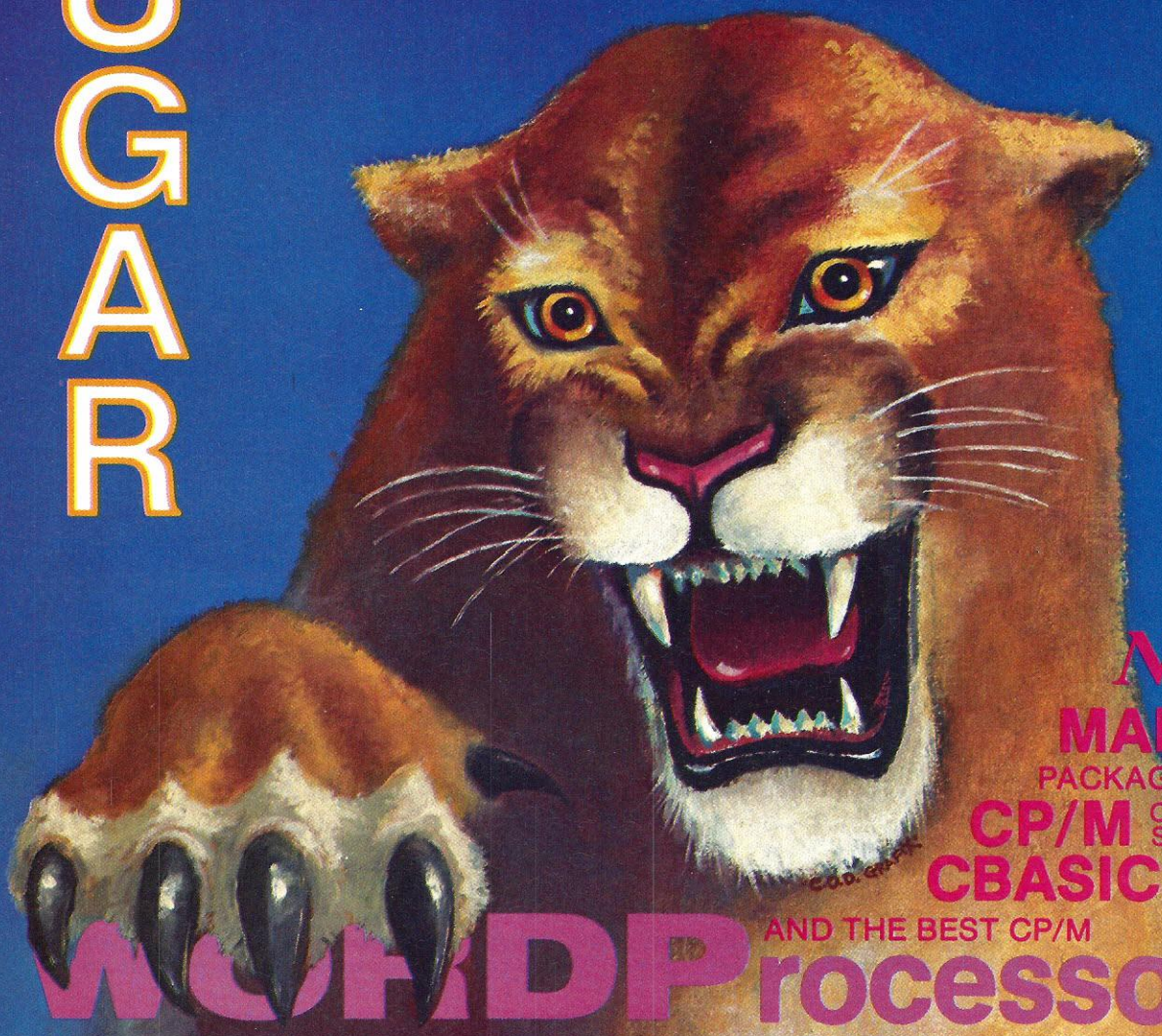

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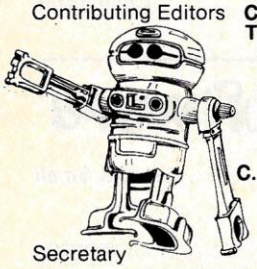

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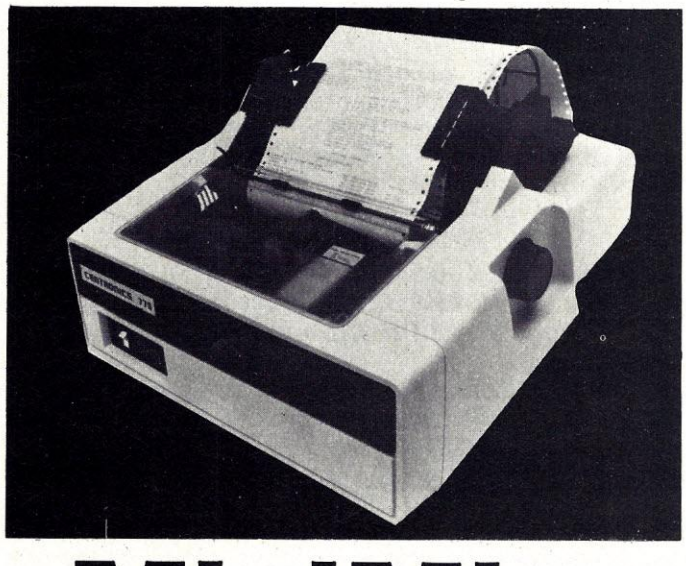

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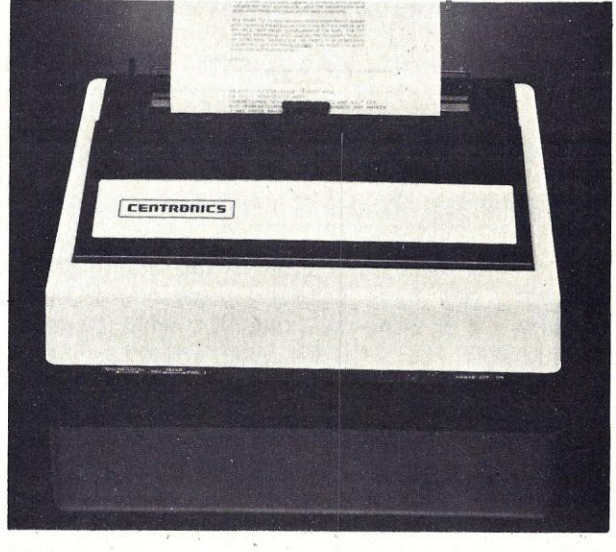

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David H. Ahl

MORE MICROCOMPUTERS IN SCHOOLS

About one-half of the Nation's school districts use a total of 52,000 computers for instructional purposes, mostly "computer literacy." Microcomputers now outnumber timesharing terminals by 3 to 2.

Just over 7600 schools (one-half of all secondary schools, 14% of elementary schools and 19% of vocational and other schools) have computers.

Eighteen percent of the schools without computers plan to get one or more in the next three years. What about the other 82%? "No plans at present."

Source - U.S. Dept. of Education

NAKED MICROACE ON THE WAY. ALSO ZX81.

We hear that the MicroAce II will be announced shortly. It will have a full-stroke keyboard, possibly 16K of on-board memory, will run 8K ZX80 Basic, but will not have a case or housing. According to insiders at MicroAce, it is a much improved machine and allegedly better than the recently introduced ZX81 by Sinclair/England. Well, maybe.

Speaking of the ZX81, it uses a new custom chip made by Ferranti which replaces 18 chips in the old ZX80. The ZX81 has a total of only four chips including a Z80A mpu as before. A new "slow" mode of operation allows the ZX81 to compute and display simultaneously. Hence, continuously moving displays are possible without the flicker that plagued the ZX80.

The ZX81 uses the 8K Basic ROM promised for so long for the ZX80. This allows floating point arithmetic, log and trig functions and a new array of graphics functions. User RAM is still just 1K expandable to 16K. Price for the kit is £50 (about $110), assembled £70 (about $155).

DATA BASE ON BUSINESS CARD

Dr. Thomas Stockham, Jr. is at it again. The inventor of the digital recording process has devised an all-digital record the size of a business card. The player uses a laser-based optical tracking system developed by DRC with which Soundstream, Stockham's company, merged last year.

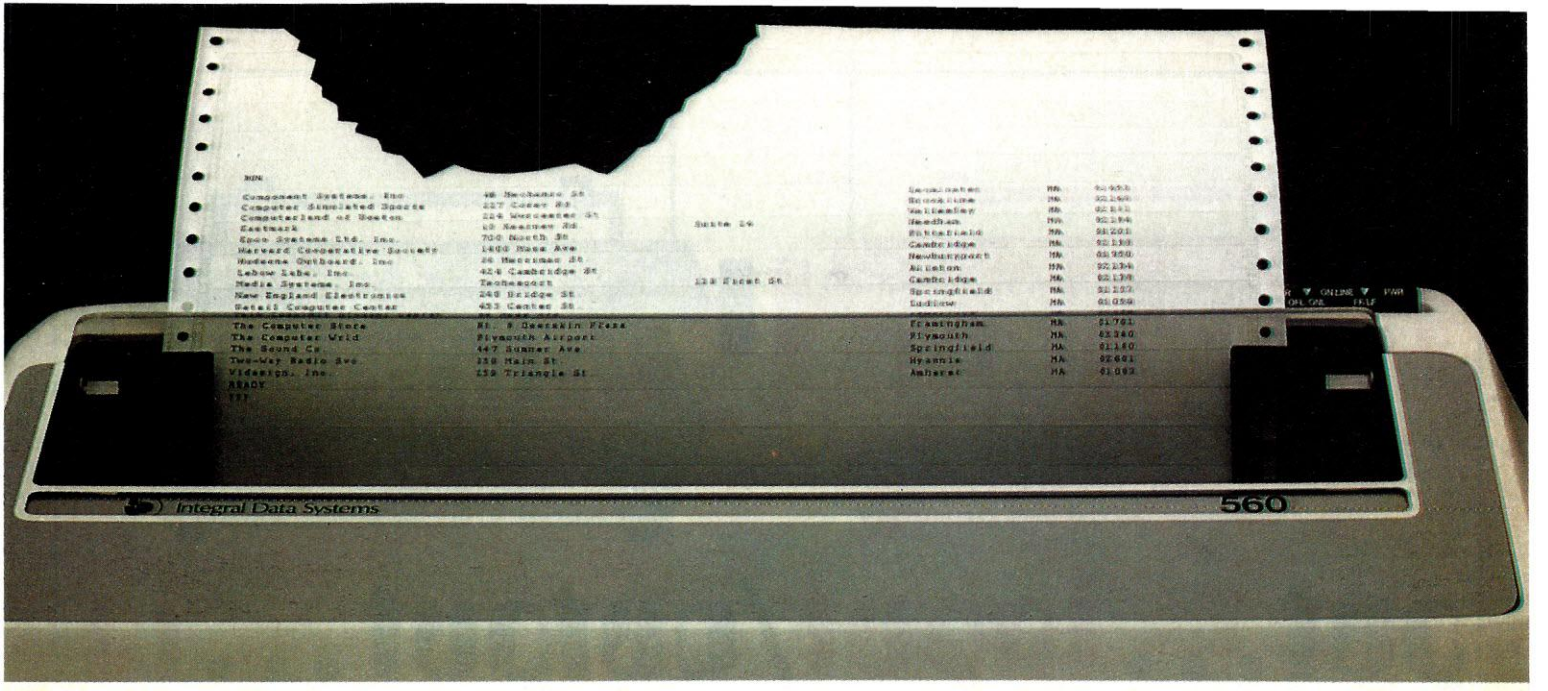
Stockham's pocket size record was developed for music, of course. However, since it uses an all-digital storage method it can be easily adapted to computer use. Using this device for distributing data bases has some nice advantages: piracy is difficult, if not impossible; there is no need to use costly telephone lines; and the hardware is relatively inexpensive.

VIC HEADED FOR WINNER'S CIRCLE?

The internal squabbling among Commodore personnel that hampered PET sales for the past two years may have quieted down now that company HQ has moved to King of Prussia, a suburb of the City of Brotherly Love. It will have to if Mike Tomczyk's optimistic sales forecast of 200-300,000 VIC's in FY 1982 (starts 7/1) is to come true.

Along with the $299 VIC (5K), a $99 direct access modem will be offered as well as a 3K memory expander and five ROM modules. Fearful of a run on ROM chips, Commodore will not allow second party vendors to market software except on cassette. VIC ROM modules will cost $20 to $40 and include Invader, Galaxian, a car race game, graphics package and programmer's aid/monitor package.

Commodore is seeking good VIC software to market but offers a rather paltry 5% of net royalty (about 3% or less of retail). Most software vendors pay three to five times that. On the other hand, the manufacturer can undoubtedly sell a good deal more than a second party vendor.



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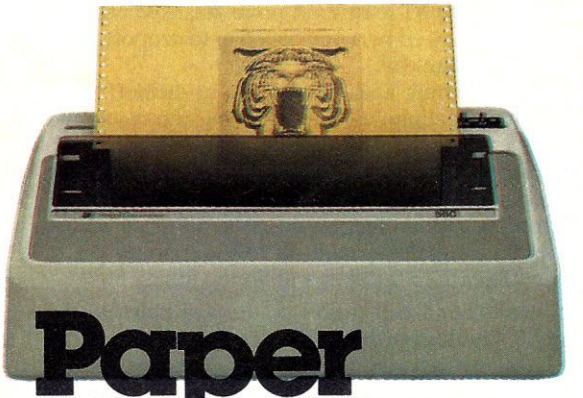

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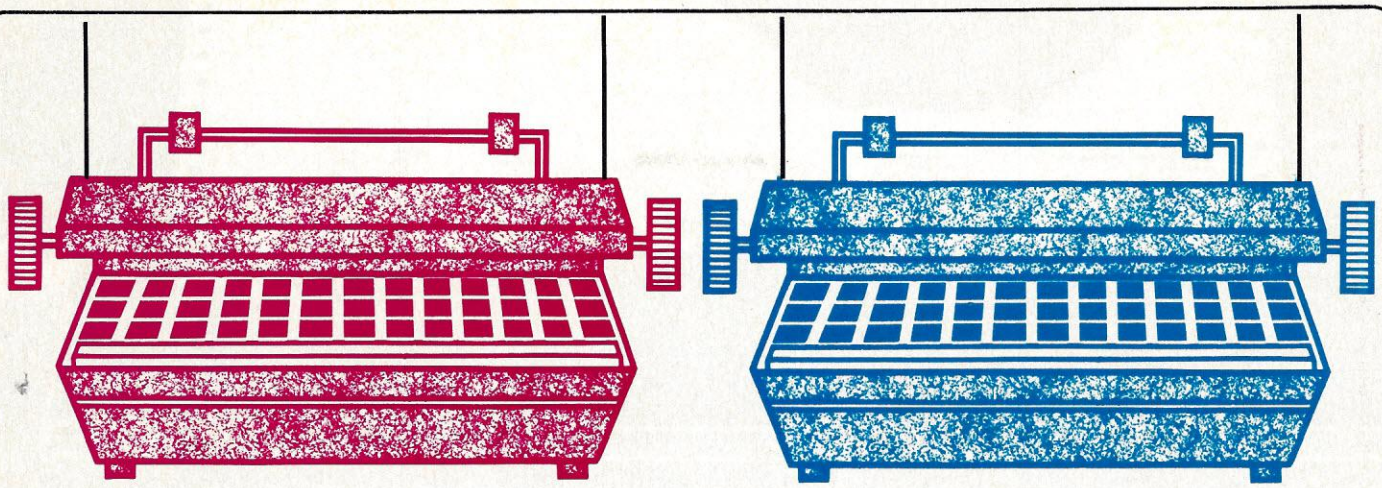

put... input/output ...in

Tanks a Lot

Dear Editor:

I believe that the solution to the "Hot Desert Sands" problem (May, 1980, page 172) given in the August, 1980 issue (page 134) can be improved upon in several ways—from 17 tankfuls down to *less than 8*!

The August solution calls for four fuel dropoff points, located 1/8, 1/4, 3/8, and 1/2 of the way across the desert—i.e., at equally spaced locations up to the halfway point. Once the truck is at that point with a full tankful of fuel, it can simply be driven across the remaining half of the desert.

Your solution asserts that 17 tankfuls are required to accomplish this; actually, 13.5 tankfuls suffice, as follows:

The truck fills up, goes to the first dropoff point, leaves half a tankful of fuel there, and returns. It repeats this process 13 times, leaving a total of 6.5 tankfuls at the first dropoff point. The remaining 0.5 tankful allows the truck to make a final one-way trip to the first dropoff point, bringing an additional 0.25 tankful there.

We now have the truck and 6.75 tankfuls of fuel at dropoff point #1. In a similar manner, the truck now makes 6 round trips from dropoff point #1 to dropoff point #2, leaving half a tankful each time, followed by a one-way trip to dropoff point #2, bring another 0.5 tankful.

We now have the truck and 3.5 tankfuls at dropoff point #2. Using the same techniques, we can bring the truck and 1.75 tankfuls 3 x 9.5 + 0.25) to dropoff point #3. The 1.75 tankfuls are precisely enough to bring the truck, with one tankful, to dropoff point #4, which is our objective.

However, further improvement is possible. Suppose we use *five* dropoff points, equally spaced up to the halfway point, instead of four. Then *12.4* tankfuls will do the job:

This time, each round trip from one dropoff point to the next uses only 0.4 tankful of fuel, allowing the truck to drop 0.6 tankful. Thus, the first 12 tankfuls allow the truck to drop 7.2 tankfuls (12 x 0.6) at dropoff point #1; and the last 0.4 tankful allows it to deliver another 0.2 tankful on its final one-way trip there. We now have the truck and 7.4 tankfuls at dropoff point #1.

Again we repeat the technique, bringing the truck and 4.4 tankfuls (7 x 0.6 + 0.2) to dropoff point #2; then 2.6 tankfuls (4 x 0.6 + 0.2) to dropoff point #3; 1.6 tankfuls (2 x 0.6 + 0.4) to dropoff point #4; and finally, exactly one tankful (0.6 + 0.4) to dropoff point #5, as needed.

Does the required amount of fuel continue to decrease if we increase the number of dropoff points still further? Yes, in a slightly erratic way. Using reverse analysis, with the help of a Texas Instruments SR56 programmable calculator (all I had with me on vacation), I came up with the following:

Dropoff points	Tankfuls required
3	22.67
4	13.50
5	12.40
6	11.67
7	9.43
8	10.25
9	9.56
10	8.60
11	9.45
12	9.33
13	8.77
14	8.57
15	8.67
16	8.38
20	8.20
25	8.08
50	7.88
100	7.74
1000	7.6840
2000	7.6800
3000	7.6780
4000	7.6755
16000	7.6736

These results seem to be approaching seven and two thirds tankfuls. I intend to investigate further with a program in Basic.

Richard Staum
Professor Of Mathematics
Kingsborough Community College
C.U.N.Y
Brooklyn, NY 11235

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CIRCLE 255 ON READER SERVICE CARD

put... input/output... in

Language Barrier

Dear Editor:

It would be nice to try running the "Streets of the City" program, the winner of your simulation competition. It was published in the April issue.

But it is very cryptic. I don't own a TRS-80 machine and will have to modify this program. That is, if I can figure out my machine's equivalent to obscure expressions like "PRINT @ 520,CHR$(194)," and "DEFSTR F," two letter variable names, and multi-statements on a line. It also includes hardware dependent features such as time wasters "FOR X=1 TO 5000:NEXT X."

This program, as published, may be a great simulation. Keying it in is a big enough job without having to do major translations of TRS-80 Basic's dependencies.

David P. Gross

This is a difficult problem for us. Good graphics are vital in game programs, and probably in most other program areas as well. Yet graphics on each computer are incompatible with those of other computers. Sensational Software is converting Trucker and Streets of the City to the Apple and Atari computers, and we have a version of Streets of the City for the CBM. That may solve your difficulty. Perhaps a better solution would be for one of our readers to write a comprehensive article on graphics conversions from one computer to another?—GB

Good Point

Dear Editor:

I would like to address this to contributors of programs to *Creative Computing* (particularly games using graphics). The number of versions of Basic is increasing every day as new computers are introduced; many have their own special commands and graphics functions. Deciphering these special functions is next to impossible and may make an excellent program useless to a user of a different computer. Therefore, use these commands by all means (they're great and save a lot of time). *But* explain them to your reader and define what they do. Take a look at the better programs in these pages and you'll find they are consistently well-documented, complete with definitions. Even RND(x) can mean different things to a TRS-80 than to an Apple. (It really does.)

Barry Papoff
Toronto, Canada

A good point—we concur—EBS

Reset Reply

Dear Editor:

I would like to respond to Eric Shirley's letter in the December issue. The solution to his problem is given explicitly on page 37 of the Apple II Reference Manual. The Soft Entry Vector—the address to which control branches after a RESET—is located in locations $3F2,$3F3 (decimal 1010, 1011). An additional byte, $3F4 (or 1012 decimal) must be set to an appropriate value by executing a subroutine located at $FB6F (64367 or -1169 decimal.)

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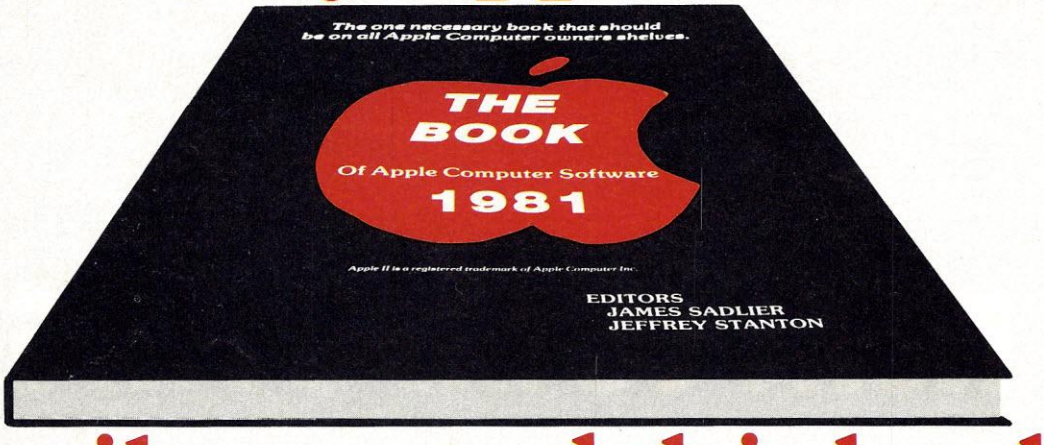
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CIRCLE 182 ON READER SERVICE CARD

put...input/output...in

A sequence of instructions to enter the Monitor upon RESET, without limiting the amount of usable memory space, is:

CALL-151 enter Monitor
$3F2:69 FF put Monitor address into Soft Entry Vector
$FB6FG execute subroutine to set value in location $3F4
Now RESET will invoke the Monitor.
An alternative set of instructions for Basic is:
POKE 1010,105
POKE 1011,255
CALL-1169
After these immediate mode commands are entered, pressing the RESET key will invoke the Monitor directly.

James E. Godderz
P.O. Box 86
Dunellen, NJ 08812

Videx Revisited

Dear Editor:

I have just finished reading your article on 80-Column Cards in the April issue of *Creative Computing*. I found it very interesting, and it makes me feel lucky. I just bought an Apple II+ a few weeks ago with Easy Writer Pro and a Videx card. Fortunately they have improved the situation since the card that you tested was made.

It is now possible to make the shift from lower to upper case by use of the Escape key and it doesn't stay shifted (i.e. locked) unless you hit the key twice. The ctrl-A routine which you describe would have been a pain.

Your other criticism of the Videx seems to have been improved also. At least the combination that I have with a 9" Panasonic monitor (B&W) gives me a separation of letters on the screen that appears quite a bit less crowded than the pictures of the 20-line display which accompanies your article.

Tom Shreve

Wails from the Crypt

Dear Editor:

The data security article by C.W. Noah ("Protect Those Data Files," March 1981) was quite interesting, but the cryptographic enciphering system given is *very* insecure. The challenge cipher (not code) given at the end uses the key sequence: 73-170-129-63-154; and reads: "I WILL PAY FOR ONE YEAR'S SUBSCRIPTION TO CREATIVE COMPUTING FOR THE FIRST PERSON TO DECODE THIS MESSAGE."

Being an amateur cryptographer and a member of the American Cryptogram Association, I was quite amused by Mr. Noah's feeling of complete security in the sysytem, on the grounds of the large number of keys necessary for a trial-and-error approach to cryptanalysis. What he and other "crypto-inventors" don't realize, is that a cryptanalyst does not rely on brute force techniques, but uses the *weak points* of the system itself to decipher it.

In this case, the system is simply a modified form of a class known as Periodic Polyalphabetic Substitution. The use of the XOR function is good for a computer, but does little for security here. While a trial-and-error computer approach to solution may take 35,000 years the standard techniques for this class of cipher allowed a pencil-and-paper solution in less than 3 hours. (Eight errors appear in the message, but don't affect solution.) Use of longer key number sequences adds little to the security.

While the method described here may be secure enough for data of low value against accidental exposure or a simply curious person, it has no value against a determined opponent. Remember: locks only keep out honest people. If highly sensitive data is to be protected, then more complex computer cryptographic systems should be considered, preferably with the aid of someone knowledgable in cryptography.

Rudolph F. Lauer
Dept. of Chemistry
MIT
Room 6-431
Cambridge, MA 02139

I'm afraid it is presuming too much to expect that Creative Computing *has more knowledge of every subject published than our authors. We would rather risk occasionally publishing something to which readers might take exception than limit our content to safe and possibly boring areas.—GB*

Purr-loined Letter

Dear Editor:

Enclosed you will find a picture of our family Compu-Cat, Boot-sie. She obviously has decided that the only way to keep up with a family of father, mother, three daughters and sons-in-law which includes applications and systems programmers, programmer analysts, a computer manager, a computer math teacher, a computer student, and a hobbyist, a Heathkit H-8, an Apple II and an Atari 800 is to read closely each issue of *Creative Computing*. She thinks that your articles are purr-fect reading for the novice as well as the more initiated. She particularly liked the recent articles on anima-tion. She is currently working on a program to devise a better mousetrap so that she can spend more time on programming. It really bugs her to take time away from her terminal to byte a passing mouse or two.

She says to keep up the good work.

Jan McDonald
241 Moe Rd.
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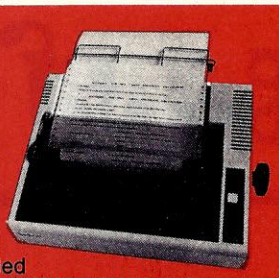

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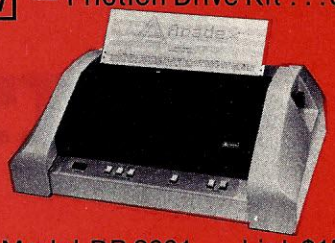

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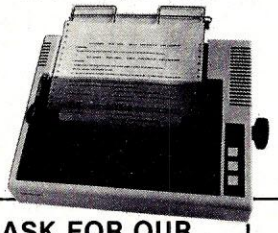

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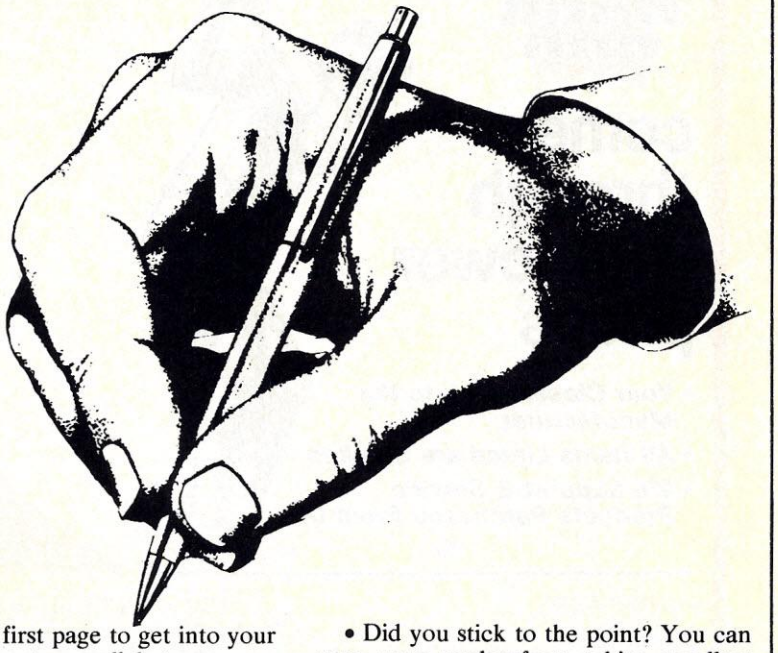

Edward J. Stone

You've just finished typing that report for the boss, or that computer article, or that lengthy memo—and you're very proud of it. The approach is creative and unique, and you've researched it thoroughly. You've included every last detail, and checked it over at least three times. Now all that remains is to pop it in the envelope or chuck it into the "In" box, and cross your fingers—right?

Nope!

There's one last thing you can do that will make your boss or editor bless you. It will improve your chances of being promoted or published. It will even make you a better writer. What is this magical task? *Edit your own work!* Pretend someone else had written it, and take a fresh look. Here are some key things to check:

• Give your article a quick rereading first (Oops! You didn't write it, remember! Someone else did. Hold that thought as you go through it.) Does it proceed logically from one point to another, and to your conclusion? Are the sentences as short and simple as possible? Long sentences will get in your way and tire the reader. Try to use action verbs, or "ing" forms. They will make your writing livelier and move the reader along. He will find it more interesting.

• What's the theme of your article or report? Have you gotten into it right away, or meandered a bit first? Don't wait until the end of the first page to get into your subject. That puts a wall between you and the reader that blocks what you really want to say. Why should someone read the article? What's in it for him? Tell him up front, in the introduction.

• How are your paragraphs? Many of us have trouble making the transition from one paragraph to the next. Generally, the first sentence of a paragraph should have a connection with the previous sentences or paragraph. Writing is like taking the reader on an automobile ride: the smoother the better. Try to build a word bridge from one paragraph to another, instead of changing subjects abruptly. Then your reader's "car" won't have to jump over potholes in the road of words that you have built.

"Shorter is sweeter" is also good advice. Make sure your paragraphs are not too long. And when you change subjects, start a new paragraph. It's a courtesy to the reader, like a road sign is to the driver. You are saying, "Prepare for a bend in the road."

• Try not to use big words when small ones will do. The simpler words have more punch, and will do a better job for you. They won't get in the way of what you really want to say. That goes for long, descriptive passages with lots of adjectives too. They're beautiful, but they just steal attention from your main points. If you want to save them, jot them down on an index card and file them away. Be merciless!

• Did you stick to the point? You can save your reader from taking needless side roads if you outline your article before you write it, and stick to that outline. Make sure each point leads to the next! Also, use examples to illustrate your points. Visual examples will stick in your reader's mind; dull facts won't. Don't tell him . . . show him!

• Finally, if you're writing on something that's been covered before, emphasize what's *new* this time. Sure, many people have written about word processing systems—but you're giving the topic an interesting new twist. What is it?

Now that you've finished your first rereading, you may want to go back and polish your writing even more. This can be a game as challenging as Air Traffic Controller and as much fun as Space Invaders! If you keep that in mind, you may be surprised to find how much you enjoy doing it. Keep a good dictionary and thesaurus (book of synonyms) at your side, and don't be afraid to use them. If you think your grammar needs some help, pick up a copy of Strunk and White's *Elements of Style*. Some people are on steady ground if they think it "sounds right," while others aren't. If organizing your thinking seems to be a problem, consult books by Flesch or de Bono. And if you're writing an article, be kind to your editor by following the style sheet of the magazine.

You may get to like it so much that one day you'll be an editor yourself! □

Edward J. Stone, 764 Brady Ave., New York, NY 10462.

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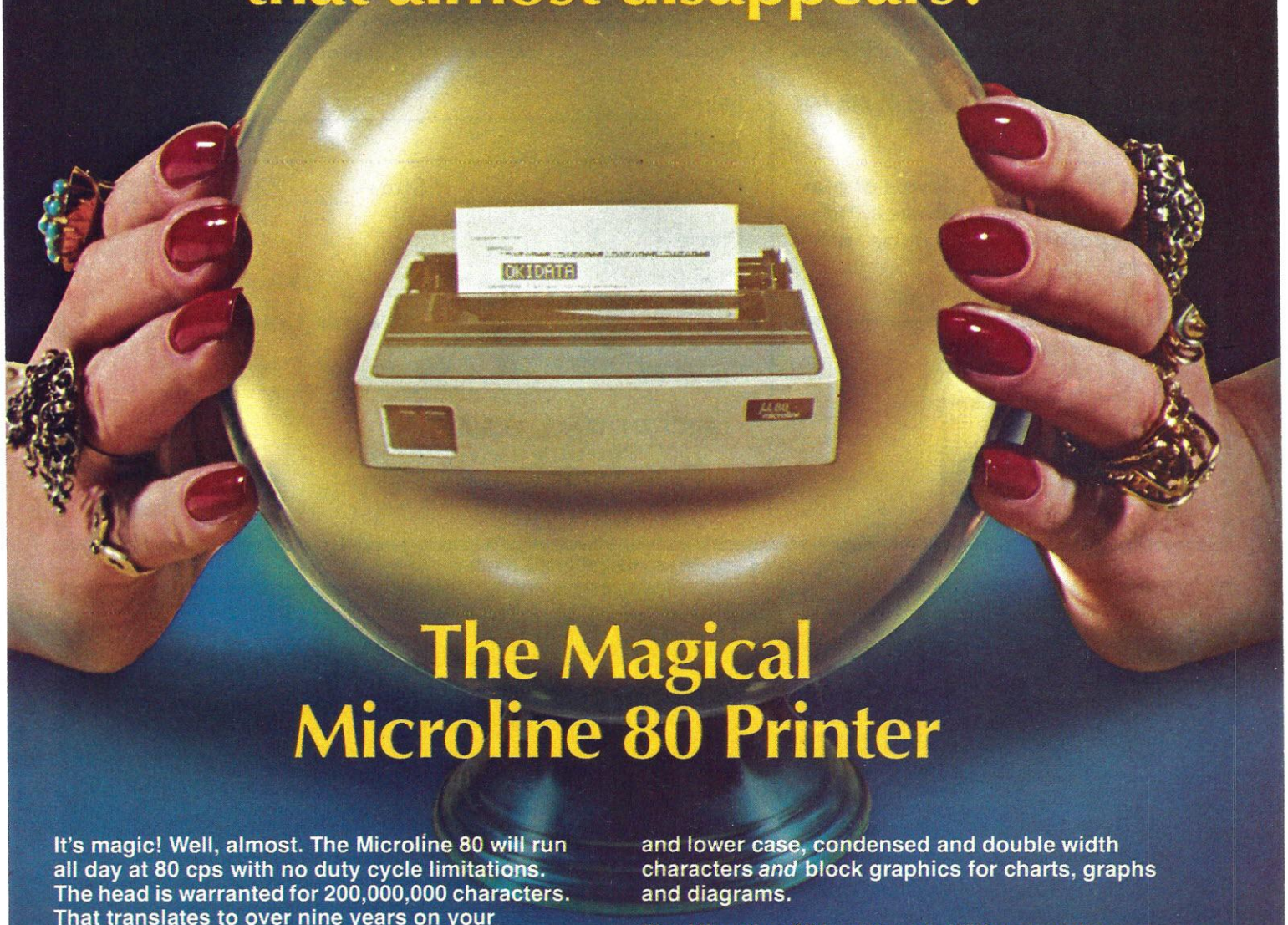

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CIRCLE 134 ON READER SERVICE CARD

Word Processing with the Radio Shack TRS-80

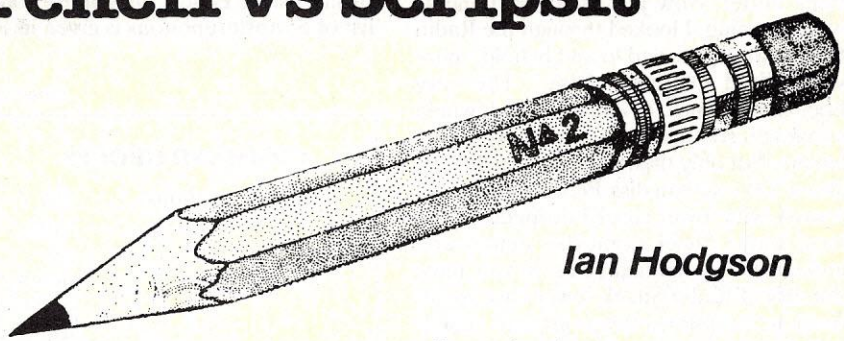
The TRS-80 is a good choice for word processing. It is reasonable in price, has inexpensive, quality service available within a few miles of most of the U.S. population, there are at least three excellent software packages for word processing, and a wide selection of printers can be easily interfaced to the TRS-80.

Creative Computing magazine is produced by TRS-80 computers. We use an interface from Irwin Gretczko (G2 Enterprises, 255 W. 90th Street, New York, NY 10024) to connect a TRS-80 computer to an AlphaComp typesetter. The system also has an Omikron 8" drive system installed. (The interface boards, two 8" drives, CP/M operating system, MBasic, and Phoenix Word Processing system sell as a system for $1700 from Omikron (1127 Hearst Street, Berkeley, CA 94702.) We are able to prepare Electric Pencil files on our CP/M systems or Scripsit and Electric Pencil files on our TRS-80 systems and dump them directly into the typesetter. Nearly every article in the magazine has been prepared this way for the past year.

We are currently installing a micro-Composer interface ($1500 from Cove View Press, Box 637, Garberville, CA 95440) to connect another TRS-80 computer to a Compuwriter typesetter. In addition, we are installing an auto answer modem on another system to allow us to receive ASCII files over the telephone, edit them on the screen, and typeset them all by computer.

In this section, we review Scripsit, Electric Pencil, and Lazy Writer, the best known word processing programs for the Radio Shack computers. We also review two programs that add extra features to Scripsit, Scripmod and Superscript. We conclude the section with the experience of Bill Horvath, a consultant who uses a Radio Shack system for his business correspondence.—George Blank

Pencil vs Scripsit



Ian Hodgson

The combination of the TRS-80 and Electric Pencil has been a very popular one for a couple of years now, and I have been using it for quite a while to produce manuscripts, and tests and reviews for my students. It is so much faster and less frustrating than a typewriter that I didn't begin to notice its shortcomings until recently.

Sometimes, the program bombs in a manner reminiscent of a photon bomb hitting a Klingon ship.

One of Pencil's problems seems well known: that is, its tendency to drop letters when a fast typist reaches the end of a line, and the last word jumps to the beginning of the next. During the jump, the keyboard is ignored, so characters typed are lost. It can be quite frustrating to have to slow down at the end of each line. Some of its other limitations are just as annoying. For instance, if you type a line which has no spaces in it (say you want to underline a long title with dashes, for example), when you reach the 65th character the line will just disappear.

Sometimes, the program bombs in a manner reminiscent of a photon blast hitting a Klingon ship. This problem also occurs if you try to edit a Basic file (from disk) where the lines have been compressed to save time/space. Another limitation appears when you try to use Pencil to set up tables or charts that are more than 64 characters wide. In this case the lines

Ian Hodgson, 296 Malcolm Circle, Dorval, Que., Canada H9S 1T7.

wrap around, and it is very hard to tell where the columns are. The same limitation makes it hard to tell when a word is going to be at the end of a line, so that you may end up with a number on one line, and its units on the next, and you might get "60" and "mph" on the next. This doesn't cause much trouble in regular text, of course, but in technical writing it is awkward.

Another difficulty arises when you want to indent a block of text, or change printing format during a print run. You can't; at least, not without stopping the printing and resetting parameters. And have you noticed that if you end a paragraph by hitting Enter, just after the last word has wrapped around, the cursor returns to the beginning of the same line rather than the next?

Finally, how many times have you saved a long, long text file and then discovered the next day that you forgot to set the cursor to the beginning before saving and it is all gone?

Now none of these problems is insurmountable; in fact, the whole system is so much easier than a typewriter that I usually sing its praises loudly. But, occasionally, the thought would cross my mind that maybe, just maybe, there was something better. Now just as these thoughts were ripening, I looked through the Radio Shack catalogue, and lo and behold, there was "Word Processor Disk." The very brief blurb seemed to indicate that it would eliminate some of the problems I was having. Not only that, but it was, at $99.95, about $50 less than disk Pencil. But, would it work with lower case? I dropped by the local Radio Shack computer center and looked at the manual. Yes, if you have the offical Radio Shack lower case modification, Scripsit (as the program is called) will handle lower case. Now came the risk. It was going to cost me $100 to see if the official lower case mod was similar to the Pencil mod that so many of us have already done. The answer—YES! My money was not spent in vain. It worked perfectly.

For those of you who don't know about these lower case modifications: the character generator in the TRS-80 has both upper and lower case letters, but to save a bit of money, the folks at Radio Shack left out one memory chip (a 2102) thus leaving only 7 bits rather than 8 for screen memory. Bit 7 is used to indicate graphics mode, so only 6 are left for characters. This is not enough for a full 96-character ASCII set, so they "fake" the missing bit with a couple of gates, and all letters print in upper case. The lower case modification consists of deleting the fake bit and adding an extra memory chip, thus allowing a full character set to be displayed.

It takes a while to learn how to use Scripsit. In fact, the program comes with a set of six one-hour lessons on audio cassette, and the manual is designed around these lessons. This does make the manual a bit cumbersome for those of us who try to look things up without taking the self-teaching course, but there is a summary at the back which answers most questions.

The entire screen scrolls to the left, and continues doing so until you reach the end of the defined line.

Scripsit also comes with a set of stick-on labels for your keyboard, which make it much easier to remember what all the control keys are, and a quick reference list of all instructions. But let's find out what the program does. I will concentrate mostly on those characteristics which differ from Electric Pencil, but a more complete list of Scripsit functions is given in Figure 1.

The first thing I tried was to type at about 100 wpm and see how many letters were missed on wrap around. None! True, the last word did disappear for a second or so, but when it came back all the letters I had typed were there. Score one for Scripsit.

Then I wanted to see what horizontal scrolling was all about. In Scripsit you can define the screen width to be anything you want up to 132 characters. It is usually advantageous to set it the same as your printer width, if you are typing anything that needs special formatting. When you reach the end of the 64-character video line while typing, the entire screen scrolls to the left, and continues doing so until you reach the end of the defined line, at which point it jumps back to the right again. (Score one more—when you get to the end of a line with no spaces, Scripsit just continues on the next line.) So when you set up tables or exam questions, or want to see which word is at the end of a line, you can see just what you will get.

There is a WINDOW command which allows you to move the screen in any direction without typing characters. As a further aid in setting up columns, you can set tabs in as many positions as you want, and the tab locations are visible as dots in a solid line that run across the bottom of the screen.

Figure 1. Scripsit commands.

COMMAND GROUPS		OTHER COMMANDS
Cursor motions:	left	Set video width
	right	Set paragraph indent
	up	Tab set
	down	Upper case lock
	end of file	Window up
	top of display	Window down
Terminations:	end of line	Window left
	end of paragraph	Window right
	end of page	Global replace
Deletions:	character	Global delete
	word	Global search
	line	Repeat (works with all commands)
	blanks	>*comment line
	paragraph	define header block
	block	define footer block
	unmark block	define page # block
	to end of text	define hyphen block
Insertions:	character	define block
	line	end block
Exchanges:	words	remove hyphens
	paragraphs	save to disk
	blocks	save to tape
Labelling:	open block	save in ASCII form
	close block	load from disk
Information:	cursor line #?	load from tape
	length of document?	load and append
	memory left?	
Printing:	Print	
	Print to serial port	
	Print with page pauses	
	Print "invisible"	

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		R. Guidry-P	T. Seaver-p

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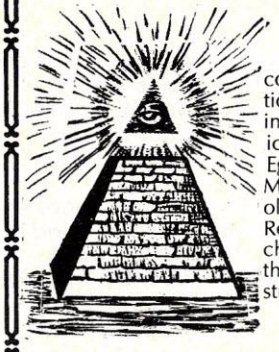

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Scripsit, continued...

The screen width command is also used for hyphenation. This command allows you to determine the best place to hyphenate words to tighten up lines. It is not a fully automatic system with memory tables, like some, but simply stops at each potential word and allows you to decide. To use the command you simply define the screen width to be the same as your printer width, define the block you want hyphenated, and enter the H command. The cursor will stop at the first appropriate word. You may hit "-" to insert a hyphen, left arrow and then "-" to insert one earlier in the word, or "enter" to leave it alone. The cursor will proceed from word to word until the block is finished. These hyphens are stored with bit 7 set so that they can later be recognized and deleted if you want to change the print width.

Another major advantage of Scripsit over Electric Pencil is that all output formatting is controlled by commands embedded in the text. Each such command line is preceded by a > sign, which must be the first character on the line. This means that you can change format as many times as you want during a printout. The format commands are listed in Figure 2. A sample text file with commands is shown in Figure 3a, while the resulting printout is shown in Figure 3b. Important improvements over Pencil include vertical centering (good for writing letters), paragraph spacing (which can differ from line spacing), flush right mode (also called ragged left), automatic horizontal centering (good for title pages) and "window suppress." This last command forces the printer to a new page if the last line on the previous page would start a new paragraph.

Figure 2. Scripsit page formatting commands.

Set page length	Set left margin
Set right margin	Set top margin
Set bottom margin	Set line spacing
Justify text paragraphs	Set # lines between
Center text	Print flush right
Center vertically	Suppress printing
Enable printing	Widow suppress
Begin header on page...	Begin footer on page...
Turn on/off header	Turn on/off footer
Beginning page number	

```
>*COMMENT LINES CAN BE INCLUDED IN THE FILE, and they_
>*don't print in the final copy._
>VC=N_
SCRIPSIT allows you to change print format by imbedding
commands in the text. The default format has a left margin
of 12, right margin of 72, and is justified and vertically
centered. This paragraph is printed in the default format,
although it is not vertically centered._
_
>C=N J=Y LM=25 RM=59_
Long quotes are often inset from the body of a report as
shown in this example. Many text editors make it possible
to do this easily._
_
>J=N LM=12 RM=72_
Another format is "ragged right" (or flush left). Justifi-
cation is turned off, and, if desired, the lines can be
evened out by hyphenating words. This paragraph is printed
in the ragged right mode._
_
>FR=Y_
     Flush right (sometimes called ragged left) is another
print mode available on SCRIPSIT. It is most often used for
page headers or sometimes for labelling diagrams. Text
printed this way looks a bit unusual, but could be used for
decorative purposes._
_
>FR=N C=Y_
Centered text is useful for page numbering,_
title pages, and similar uses. It is not justified.
Justified centered text can be_
accomplished by setting appropriate left and right margins.
Notice that all_
of these changes, and many more, can be set during printing
by means of imbedded commands._
```

Figure 3a.

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TRS80 MODEL 1 LEVEL II COMPATIBLE	YES	YES	NO
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CASSETTE BAUD RATE	500/1000	500	500/1500
FLOPPY DISK CONTROLLER	SINGLE/ DOUBLE	SINGLE	SINGLE/ DOUBLE
SERIAL RS232 PORT	YES	YES	YES
PRINTER PORT	YES	YES	YES
REAL TIME CLOCK	YES	YES	YES
24 X 80 CHARACTERS	YES	NO	NO
VIDEO MONITOR	YES	YES	YES
UPPER AND LOWER CASE	YES	OPTIONAL	YES
REVERSE VIDEO	YES	NO	NO
KEYBOARD	63 KEY	53 KEY	53 KEY
NUMERIC KEY PAD	YES	NO	YES
B/W GRAPHICS, 128 X 48	YES	YES	YES
HI-RESOLUTION B/W GRAPHICS, 480 X 192	YES	NO	NO
HI-RESOLUTION COLOR GRAPHICS (NTSC), 128 X 192 IN 8 COLORS	YES	NO	NO
HI-RESOLUTION COLOR GRAPHICS (RGB), 384 X 192 IN 8 COLORS	OPTIONAL	NO	NO
WARRANTY	6 MONTHS	90 DAYS	90 DAYS
TOTAL SYSTEM PRICE	$1,914.00	$1,840.00	$2,187.00
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SCRIPSIT allows you to change print format by imbedding
commands in the text. The default format has a left margin
of 12, right margin of 72, and is justified and vertically
centered. This paragraph is printed in the default format,
although it is not vertically centered.

          Long quotes are often inset from
          the body of a report as shown in
          this example. Many text editors
          make it possible to do this
          easily.

Another format is "ragged right" (or flush left). Justifi-
cation is turned off, and, if desired, the lines can be
evened out by hyphenating words. This paragraph is printed
in the ragged right mode.

      Flush right (sometimes called ragged left) is another
print mode available on SCRIPSIT. It is most often used for
     page headers or sometimes for labelling diagrams. Text
printed this way looks a bit unusual, but could be used for
                                    decorative purposes.

       Centered text is useful for page numbering,
   title pages, and similar uses. It is not justified.
              Justified centered text can be
accomplished by setting appropriate left and right margins.
                    Notice that all
of these changes, and many more, can be set during printing
              by means of imbedded commands.
```

Figure 3b.

Putting >* at the beginning of a line allows you to insert comments (which will not be printed) in the text.

Scripsit allows more flexible page titling than Pencil. In Pencil, you may use one line (less ten spaces for the page number) for a title which will appear at the top of each page, followed by the page number at the top right corner. Scripsit lets you have multiline (up to 16) headers and/or footers, and the page number can be anywhere you want at the top or bottom of each page. You can also format the page number, so you could have "PAGE 3," "page 3," "p. 3," or even "This is page 3" if you wish. The headers and/or footers may be on every page, on even pages, or on odd pages, and you can have a different header on even and odd pages, so that you could have, say, the chapter number on the right-hand pages and the topic on the left-hand ones, with the page numbers on every page. Footnotes can be done in Scripsit, but not easily, as it does not have specific provision for them. Headers and footers can be turned on and off or changed at will anywhere within the text.

Entering text in Scripsit is very much the same as in Pencil, but whereas Pencil zeroes all of RAM for a buffer before you start, Scripsit does not. In fact, Scripsit starts you off with 60 blanks (spaces) in the text buffer and you type over them. When you use them up it gives you 60 more, and so on (the letter you are typing disappears for a tiny fraction of a second while this happens, but you don't lose it). You cannot advance the cursor past the buffer area. This leads to one slight inconvenience. If you have a terminated line, such as one ending with ENTER at the end of a paragraph, you cannot move the cursor past the end of that line unless you use the "insert line" command to put 60 blanks there. In fact, there is no multiple-insert mode as there is in Pencil, so to insert a word you press "insert line," then type in the word, then hit CLEAR to eliminate the excess blanks. It sounds a bit inconvenient, but you rapidly get used to it, and the insert mode in Pencil is not much better, especially if you are inserting at the beginning of a long file, in which case the entire file moves after each letter and insertions are painfully slow. In both editors, after you finish inserting the first line, more space automatically opens up one line at a time.

In Pencil you can define a block of text and then delete it or move it to another location. This allows you to rearrange the order of what you are writing and makes short work of editing. Scripsit allows you to do this with multiple blocks, as each is identified by means of a letter. There is also an "exchange block" command which is very useful.

Scripsit also allows you to exchange paragraphs or words. The procedure is the same in each case: simply place the cursor anywhere in the second paragraph (or word) and hit "exchange paragraph" (or "exchange word") and the job is done. This allows easy tidying of sentences that might read better if the words were reordered.

The Electric Pencil supports two printer drivers. If a line printer is connected to the parallel port, it will be driven more or less normally. I say "more or less" because Pencil supplies line feeds after carriage returns and the Radio Shack line printers will double space in this mode, which is fine if you want double spacing, but Pencil will then give you pages twice as long as normal too. There is a special command (SX) to fix this, but it allows single-spacing only, and requires reloading of Pencil to change once it is set. (Pencil seems really to be set up to use the TRS-232 interface, which does software timing and outputs 300 baud ASCII via the cassette port. It will automatically switch to this mode if there is no line printer.

There are three print commands in Scripsit. "P" will send output to the line printer, in completely Centronics (i.e. Radio Shack) compatible form. "P,S" will send the output to the RS-232 port on the expansion interface. Adding the ",I" suffix to either of these will print the entire file, including formatting commands and comments. Unfortunately, Scripsit assumes that your serial printer supplies its own line feeds. Mine doesn't, and using double-line spacing to overcome the problem gives you pages half the normal length; just the reverse of Pencil's problem. Score -1 for Scripsit.

On the plus side, though, if you want to use single sheets of paper (for example, letterhead) in your printer, adding a ",P" suffix to any of the print commands will cause output to stop at the end of each page while you put in a new sheet. One nice feature is that Scripsit always scans the "clear" key, which is used to abort commands in progress. This key is even scanned during printing, while the program waits for the line printer "busy" line to clear, so you can regain control even if your printer stops, runs out of paper or is unselected. Normally this would require rebooting and would imply loss of your file. (This is what happens with Pencil.)

When you load a file the first time from disk, Scripsit remembers its filespec and drive number until it is changed. Saving the modifed file is just a matter of typing "break" then "S". Scripsit will even remember the drive number on which it found the file if you didn't specify it, and append that number to the filespec so that when you save the file again it will be saved on the diskette from which it originally came. The cursor does not have to be moved to the beginning of the file! It quickly becomes a habit to type "break S" every few minutes to back up the file onto disk in case of power failure or what have you. Similarly, if you have botched the file since last loading it, "break L" will reload the original. The current file name can be ascertained with the "break ?N" command. Commands for saving to and loading from cassette are also included.

Although there are ways to do it, Pencil

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is hard to use with Basic files. If you try to load a Basic program or data file into Pencil it doesn't load, and DOS ERROR 22 appears. (The Pencil fix included with the VTOS operating system overcomes this problem, and also allows Pencil to operate with NewDOS, which it doesn't normally do either). The problem of lines longer than 64 characters without a space still remains even if you do get the file loaded, though. On the other hand, Scripsit operates perfectly with Basic program and data files (except that I haven't found a way of entering an up-arrow for exponentiation) or any other ASCII files. There is even a special ASCII save command in Scripsit so that Basic-compatible files will be produced. This is necessary because all command characters (such as paragraph ends, etc.) are normally stored in Scripsit files with bit 7 set, which would cause confusion since Basic would be looking for hex OD to terminate lines and would see hex 8D instead. In the ASCII mode, bit 7 is not set. When you load an ASCII file into Scripsit it will determine the control characters from the context, and set bit 7. (Scripsit did not originally work properly with NewDOS, failing to load the last record of a file, but patches to Scripsit are now supplied with NewDOS 80.)

Scripsit operates perfectly with Basic program and data files.

Incidentally, Scripsit works fine with Pencil files, although you will have to add the formatting commands. And the VTOS-fixed Pencil works on Scripsit files too, within its limitations.

Well, I seem to be running the risk of writing an instruction manual here, so I guess I'll call it quits. Which one should you use? If you have both you may find Pencil fine for short jobs—say, typing a quick letter—and, of course, it lets you use the TRS-232 interface. It also allows you a bit more freedom in moving the cursor around to insert text past the end of a line. But, for those of you with no editor yet, I can only see one reason for buying Electric Pencil: it is a smaller program (6K or so compared to 10K) and allows you more text space (4K is about one single-spaced typewritten page). This is no problem at all on a 48K system, but is worth considering if you only have 32K. Pencil has several bugs, doesn't do half of what Scripsit does, and costs 50% more. With Radio Shack software often rumored to be, it comes as a pleasant surprise to find a dynamite text editor for a modest price right in their catalogue. □

Thoughts on Scripsit

The following is part of a letter sent to John I. Snodgrass, Jr., manager of Radio Shack Computer Services, by Peter J. Brennan, Worldtech, P.O. Box 834, Gracie Station, New York, NY 10028.

I find that I can type a great deal faster with Scripsit than Pencil. It does not drop characters at the beginning of the line and does not have any keybounce whatever, which in Pencil is a big problem for two-fingered typists like myself. The hypenation feature is useful though cumbersome. Other features that undoubtedly make the program very versatile also make it far more difficult to learn to use than Pencil. Formatting is driving me up the wall. Indeed, I have made some standard formats and saved them on disk. When I want to type, I load in the format, change the date on the header and start typing.

There are some problems and also some features lacking that I would like to see added:

1)?M gives me 32,608 characters free on start-up of my 48K two-drive system. The manual says the maximum figure, which I think I have, should be 36,909. That's quite a difference and one that matters to me since my standard manuscript will not fit entirely in memory with Scripsit but fits fine in Pencil. I wish I understood the difference.

2) I have an Anderson-Jacobson AJ-841 parallel printer, which, as you know, has Z-80-based electronics and an IBM Selectric front end. It runs beautifully with the TRS-80, or has. It doesn't run very well with Scripsit. Apparently it drops the first line feed after carriage-return-with-line-feed. LS=2 gives single spacing but the computer counts double so the page ends in the middle of the sheet. To make one blank line, one must make two line delimiters. LS=3 gives double spacing but also a miscount that ends the page far up the sheet. With a long manuscript that I had to get out in acceptable form, I was tearing my hair out. I finally set page length at 35 and set the printer mechanically to double space. It worked but is not an acceptable long-term solution. Single-space works fine.

3) I can build and save a much larger text than I can load back into the machine from disk. It saves fine, but then "L" gives me "NO MORE ROOM." Fortunately, I have "Superzap" and was able to identify and zero out the last disk sector of the text and then load the truncated version. What does one do if one does not have a way to get into the disk? The manual should emphasize this problem. Perhaps the program could be modified to flash a warning as the text in memory approaches a quantity that could not be safely saved and reloaded.

4) The instructional tapes with the manual are very helpful for getting one started. But the manual alone is not very good. It needs a lot more descriptive text and more examples of different types of formatting, problems that can arise and the like.

5) DOS allows one to work directly from the disk. You can print and read actively off the disk. I had hoped that some of this capability would be carried into Scripsit so that one would not be confined to working only with what is in memory, as is also the case with Electric Pencil and the main criticism of the program. I want to be able to take addresses and file copy from disk and mix and match it with form text on another disk or in memory to print out customized documents. I feel the TRS-80 disk system has that capability. I am disappointed that Scripsit has not capitalized on it. Are there plans to do so in some later, updated version?

Despite my carping, I am on the whole satisfied with Scripsit. I feel, though, that such advantages as it has over Pencil come at the cost of far greater complexity. I would like to see all the formatting commands and instructions put in a separate subprogram instead of as part of the text, for example, displayable on command on that bottom line.

I am also satisfied with the TRS-80, more than satisfied.—*Peter J. Brennan* □

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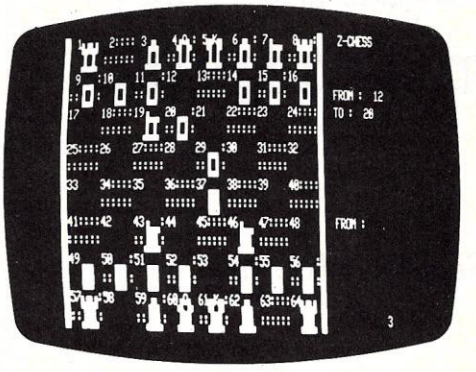

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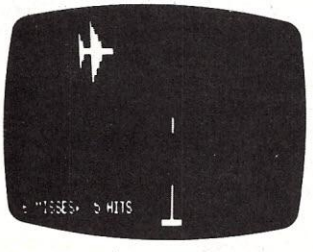

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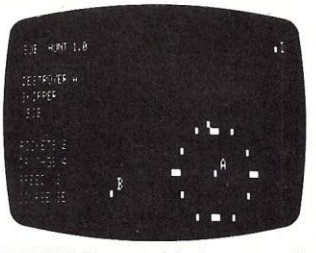
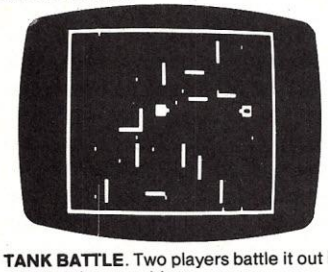
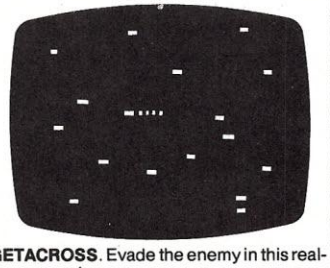


SUB HUNT. Pursue and destroy a computer-controlled submarine.



TANK BATTLE. Two players battle it out in this real-time graphic game.



GETACROSS. Evade the enemy in this real-time, sound game.

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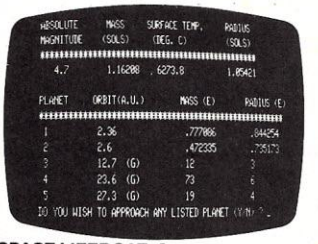
Cassette CS-3013 $19.95 3 Programs Requires 16K


ABSOLUTE MAGNITUDE
MASS (SOLS)
SURFACE TEMP. (DEG. C)
RADIUS (SOLS)
4.7 1.16288 6273.8 1.05421
PLANET ORBIT(A.U.) MASS (E) RADIUS (E)
1 2.36 .777086 .844254
2 2.6 .472335 .735173
3 12.7 (G) 12 3
4 23.6 (G) 73 6
5 27.3 (G) 19 4
DO YOU WISH TO APPROACH ANY LISTED PLANET (Y/N)

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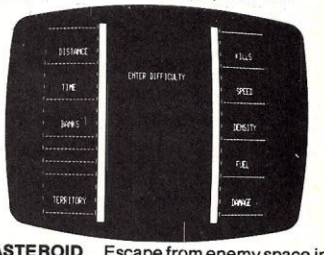
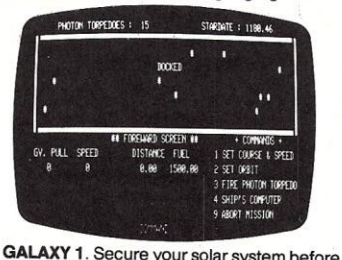


ASTEROID. Escape from enemy space in a small but powerful ship in this machine language game.



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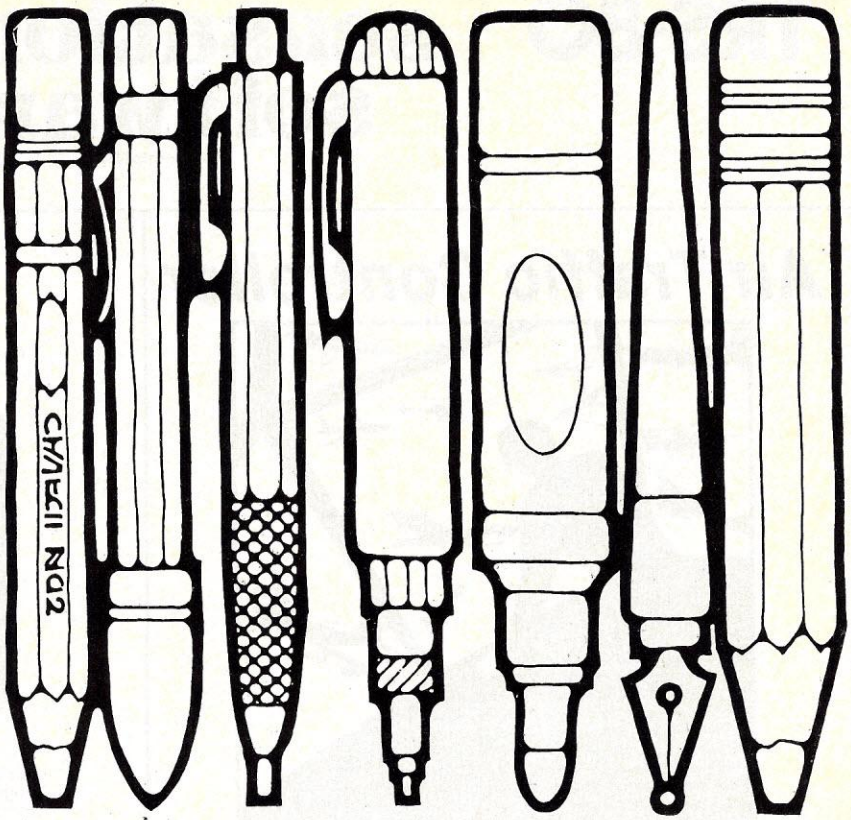
Scripmod

Improving on Scripsit

Stephen Kimmel



I discovered the deficiencies of Scripsit about halfway through chapter 15 of my third novel *Lord of High Places*. The alien hero, a green, semi-intelligent, dinosaur-like creature, is trying to bluff his way out of certain disaster. Standing on his rear four legs he screams "Rhapaka is nothing compared to the Star Lord!" I decided that bit of deathless prose needed added emphasis and should be underlined.

Although I had dutifully listened to the six-hour course that came with Scripsit, I couldn't remember how to do that. After three more hours of searching through the manual, the reason became clear. I couldn't remember how to underline because Scripsit doesn't allow underlining.

"Ah come on!" I bellowed. "You sold me a $100 program that won't make the $2000 printer you sold me underline? Or backspace. Or print a copyright character. Or. Or. Or."

Filling the vacuum

Two programs have apeared to fill this vacuum. Superscript is reviewed elsewhere in this issue. Less well-known (read "not as heavily advertised") is Scripmod, $39.95 from The Computer Store (4949 S. Peoria, Tulsa, OK 74105). It is a single program that modifies your Scripsit each time you use it. While the Scripmod system may seem awkward, I have no difficulty with it. I simply put the program as an Auto statement and it takes perhaps two extra seconds. I can't tell the difference.

Scripsit's deficiencies come in two basic classes: the missing directory from within Scripsit and the lack of ability to send the various printer control codes. Scripsit doesn't bother to send anything but the minimal set of control codes to the printer. If you are going to write a program to modify Scripsit, you have to solve the problem of how to tell the printer where to start underlining and where to stop all the other things that printers do in their heart of darkness.

Enter Scripmod

In Scripmod you type <Control> <T> at the point you want to begin or end a special function and a British pound sign (a fancy L) appears. (You can't get that character from within Scripsit under normal circumstances.) When the computer encounters the sign it goes to a special control character instruction that you have built into the text to find out what the pound sign means this time. For example, the instruction

>CC=O,N,O,N will tell the program to send control code 14 (O is the fourteenth letter) to the printer the first time it encounters the special instruction, 13 the second, 14 the third and 13 the fourth. On my particular printer, a Daisy Wheel II, a 14 control code means to start underlining and a 13 means to stop. So,

```
CC=O,N
LScripmodL
```

will print the word "Scripmod" and underline just that word.

Scripmod can send any control code that your printer is capable of receiving since it isn't limited to just those built into the program. That's also why there are no extra drivers; the one program will support anything that can be supported by a TRS-80.

O and N represent underline-related instructions on the Daisy Wheel II and the Line Printer IV but they may well be subscripting on a Qume or a Diablo. With Scripmod you have to figure out which functions are represented by what letters. It's a learning process and the authors encourage you to experiment. Perhaps your printer has control codes the manufacturer neglected to tell you about.

As for the other deficiency; to display a directory from within Scripsit, use a <Control> <M>. The program then asks which drive you want and gives you the appropriate directory.

Future Modifications

There are still more features that would be useful for a word processing package. My Daisy Wheel printer is capable of printing twice as many characters as Scripsit will show. How about somebody writing a modification to do that? I don't know about anybody else but I frequently do articles too long for even a 48K machine. Scripmod's next version will enable one section of text to load the next one, thus permitting an infinitely long document. I doubt that I'll need one that long, but I could use one capable of handling 300 pages of text. I suspect that they'll use a final control command at the end of a section to load the next section.

Let's go wild. What else would be nice to have? TRSDOS has a date function. Why not permit Scripsit access to that? Have the letter date itself. Or how about letting Scripsit access external mailing lists? Has anyone done these thing yet? □

Stephen Kimmel, 4756 S. Irvington Place, Tulsa, OK 74135.

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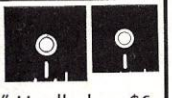

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If Only Scripsit Could...

With SuperScript, It Can!

Carl Iseli

creative computing
SOFTWARE PROFILE

Name: SuperScript
Type: Word Processing Utility
System: TRS-80 Model I, Disk Drive
Format: Disk
Language: Machine Language
Summary: Enhancement to Scripsit
Price: $29.95
Manufacturer:
Acorn Software Products, Inc.
634 N. Caroline Ave., S.E.
Washington, DC 20003

In general, the Scripsit word processing system for the TRS-80 Model I from Radio Shack has received rave reviews. It is just about the most versatile such program available for anything near its price. If you plan to use a word processor professionally, however, "just about" doesn't quite make it. Scripsit comes up lacking in several areas—some of them major, others relatively trivial. But that was before Acorn Software Products, Inc., 634 North Caroline Ave., SE, Washington, D.C. 20003, introduced a dandy modification called *SuperScript* by Richard Wilkes.

Underlining, superscripting and subscripting, special characters and boldface type are some of the more obvious abilities *SuperScript* adds to your word processing. Others, like the ability to prodce either "slashed" zeroes(Ø) or the regular variety (0), forced spacing, keyboard text insertion during printout and type pitch selectability, can come in handy more often than you might expect. Finally, *SuperScript* has added a couple of features that I can credit with having saved what's left of my sanity!

Until you've experienced the thrill of trying to save a twenty-page manuscript on disk, only to have the "DISK AREA FULL" message pop onto the bottom of the screen, you won't fully appreciate the ability of *SuperScript* to read a disk directory and kill files. Don't be smug, it *will* happen to you—probably at 3 a.m.—and your spare diskette box *will* be empty. After modifying Scripsit with *SuperScript*, you will be able either to find a disk with enough free space or kill some unnecessary files. And all the while your text remains safe and sound, waiting to be dumped whenever you are ready.

SuperScript is not a word processing system by itself, nor does the disk supplied even contain a complete Scripsit program. It combines with and modifies your copy of Scripsit, giving it all the capabilities you've wished for. The *SuperScript* disk contains the basic Scripsit modification, driver routines for several popular printers and a file transfer utility, with a versatile, general duty lower-case driver thrown in as a free extra. You transfer your Scripsit/LC program to this disk—using the file transfer option if you have only one disk drive. Then specify which print driver you will use, and the program will combine Scripsit, the modification and the print driver into one program, called "SCRIPT/CMD." SCRIPT can now be copied onto any disk using the COPY command if you have two or more drives, or the file transfer utility on *SuperScript* for single drive owners.

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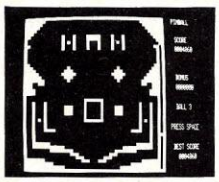

PINBALL

By John Allen

Get your flipper fingers ready for action in this real-time machine language game.

Lots of sound and flashing graphics make this fast action game so much like the real thing that you'll have to remind yourself not to shake your TRS-80.* Choose from five playing speeds to match your skill—but be prepared for a lot of practice if you ever hope to master the fastest speed.

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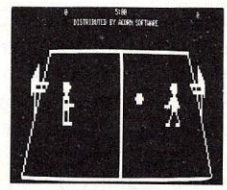
By John Allen



Fast machine language action game, with sound, from the author of the acclaimed "PINBALL"!

Try to keep up with the action and outscore your opponent in five minutes of one-on-one basketball. Steal the ball, duck around your opponent and slant toward the basket for a lay up! The graphics are based on a 3-dimensional depiction of a basketball court, and ball dribbling sounds add to the realism. Compete against a friend or your computer.

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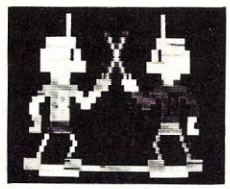
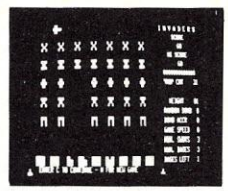


By Leo Christopherson

Your 'droid has already learned NIM, so now it's time to teach it how to wield a laser sword! For DUEL-N-DROIDS, a new type of animation and high-quality sound has been developed by Leo Christopherson, author of "Android NIM," "Dancing Demon" and other animations.

Your 'droid starts out as a lowly clown. You teach it how to use a laser sword by controlling its movements. After it attains the rank of "Grand Master," enter it in the tournament against the program. Entertainment for all ages!

Available for $14.95 on tape, $20.95 for disk.



INVADERS FROM SPACE

By Carl Miller

A new and faster machine language approach to this classic (and addictive) space game. As you play, the aliens drop bombs, move from side to side, and try to overrun your bases. All you have to do is shoot them down. It's easy—until they speed up their action!

You choose the speed, enemy bomb frequency and accuracy, and how many shots and bases you have. Unlike other games of this type, you can move your base and simultaneously fire at the invaders. Fun for all ages and skill levels, it has full sound effects for even more excitement.

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SuperScript, continued...

In order to use *SuperScript*, you must have the disk version of Scripsit and your TRS-80 must have a lower-case modification installed. The reason for the first restriction is that the tape version of Scripsit uses different memory locations than does the disk version. The lowercase requirement shouldn't bother too many people; after all, a word processer without lowercase is like Perrier without bubbles! To utilize the printing capabilities fully, you need one of the daisy-wheel, thimble type, or other letter-quality printers: Radio Shack's Daisy-II and Lineprinter IV (and its clone, the Centronics 737), Diablo (parallel or serial), NEC Spinwriter (5510 or 5530, Qume, Sanders, and Anderson-Jacobson. *SuperScript* will support other printers with underlining and slashed zeros only, provided the printer is capable of backspacing.

Active text insertion allows you to put in text from the keyboard while you are printing a Scripsit file.

One of my questions in evaluating any modification is: Does it accomplish its purpose without introducing bugs in the target program? In this, *SuperScript* really shines. The modification is almost completely invisible to the Scripsit user; you can use Scripsit exactly as described in the Radio Shack documentation and ignore the added capabilities if you like. The only exceptions to this are in the copyright notice that appears at the beginning of the program, and in the "L" (load file from disk) command. Normally, you needn't use a disk filename when you specify the "L" command, assuming that you have previously loaded or saved a file using its name. Since "L" is also used to find the length of the document in memory, it is conceivable that you might accidentally load a file—thus destroying whatever is in memory—while simply trying to find the length of the current file. Under *SuperScript*, you *must* specify a file name each time you load it.

Printing Options

Using the new features is simplicity itself. The print modifying commands are embedded into the text using the "@" key as a "control" key. For example, to start underlining a section of text, you press the "U" key while holding down "@" (control). At the point where you wish the underlining to end, just press "control-U" again. Similar control codes are used for other print operations (Table 1). Each of the new control codes has a unique graphic block associated with it that becomes embedded in the text you see on your screen. Even these blocks have been chosen to indicate, as well as possible, the functions they perform. The underlining indicator is a small square below the print line. Superscripting and subscripting indicators are tiny rectangles above and below the line, respectively. The indicator for boldface even resembles a "b" in block graphics.

Active text insertion allows you to put in text from the keyboard while you are printing a Scripsit file. Thus you can insert names or other information in a form letter, etc. This can only be done in unjustified text, and is accomplished by typing "control-Y" twice. When these characters are encountered during a printout, the printer pauses and the bottom line of the screen (the "Command Line") awaits keyboard entry of the text to be inserted; after typing the desired insertion, pressing ENTER causes it to be printed and the printout to resume. Neat!

The purpose of the "required space" command is a little less apparent. When printing justified text, Scripsit randomly inserts spaces as necessary to make the lines come out even. Occasionally, this puts two or more spaces between words that really need to "go together," like "Atlantic City" (which looks strange if it is printed as "Atlantic City"). By typing "Atlantic <control-N> City," SuperScript sees one 13-letter word (where one of the letters happens to be a space) rather than an eight-letter word, a space, and a four

Table 1. SuperScript Functions.

CONTROL CHARACTERS

Letters enclosed in brackets indicate that they are typed while holding down the "control" (@) key.

Control	Function	Remarks
[U]	Underline	Used to begin & end function
[Y] [U]	Boldface	Used to begin & end function
[T]	Superscript	Used to begin & end function
[B]	Subscript	Used to begin & end function
[Y] Ø	Slashed Zero	[Y] must precede each zero to be slashed
[N]	Required Space	See text
[O]	Left Bracket [	Appears as up-arrow
[P]	Right Bracket]	Appears as left-arrow
[K]	Left Braces {	
[L]	Right Braces }	
[I]	Caret ^	Appears as right-arrow
[Y] [B]	Set 10-Pitch	
[Y] [T]	Set 12-Pitch	
[Y] [Y]	Insert Text from Keyboard During Printout	

COMMAND FUNCTIONS

These are added functions that can be used by pressing the BREAK key, followed by the command.

Command	Function
?D	Displays the disk directory and amount of free disk space. Text is restored by pressing ENTER or space bar.
K filename	Kills the named file from the disk and frees its space. "filename" can be any valid DOS name: TVPROD/SCR:0, etc.

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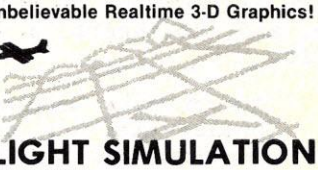

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From Sub-Logic
A graphic tour de force that will truly captivate you. If you haven't seen this brilliant program, you haven't fully utilized the capabilities of your computer! During FLIGHT SIMULATION, you instantly select instrument flight, radar, or a breathtaking pilot's-eye-view. But be sure to strap yourself in -- you're liable to get dizzy!

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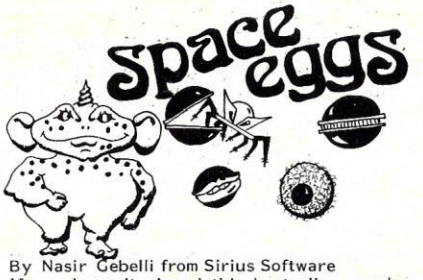

By Nasir Gebelli from Sirius Software
If you haven't played this bestseller, you're missing a real challenge -- not to mention a whole lot of fun! The space eggs are descending on your three-stage spacecraft. One shot simply hatches them into spiders, lips, wolves, or fuzzballs. Your next shot better destroy them or they're gonna getcha! Fast & fun.

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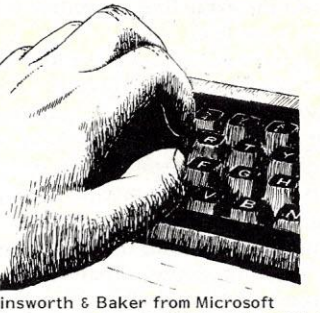

By Ainsworth & Baker from Microsoft
Speed up your programming and word processing with this excellent touch-typing instructional program. Divided into two sections, the program first teaches proper finger positioning. You practice keying various characters, the program adding new ones as you progress. In the practice paragraph section, you are evaluated for accuracy and rated in words per minute. The program continuously adjusts to your increasing skill, telling you which characters you miss and where you are slow. One of the most practical programs we know of for personal computers.

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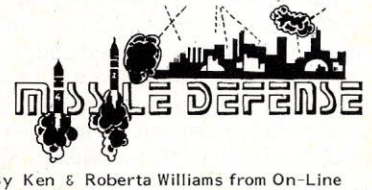

By Ken & Roberta Williams from On-Line
The Defense Early Warning System has just detected enemy ICBMs. Man your battle stations! Arm your missiles! The attack is on! As the enemy missiles flame into view, it is up to you to save your cities from certain destruction. Aim and fire your three banks of missiles wisely, because when their gone, so are you! Skill, strategy, and speed are required in this fast action game.

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Figure 1. Example of SuperScript Text.

Here are some of SuperScript's special functions: With SuperScript, any text -- even if justified -- can underlined. Horizontal lines _____ can also be drawn easily. **Likewise, you can specify boldface for any section of copy and underline the boldface text, if you like.** For research works or mathematical papers, you can call for superscripting or subscripting, and to make the distinction between the letter "O" and the number "0" perfectly clear, you can specify slashed zeros:

$$X^2 + Y^3 = Log_e 3.1000331$$

For special emphasis on indented text material, SuperScript allows you to "toggle" between 10- and 12-pitch type, and to insert a printer pause to change type wheels.

> The resulting document can be very impressive looking when you use appropriate **SuperScript** features. But don't overdo it -- like this example -- or it will simply be distracting and difficult to read.

All the features of SuperScript have not been used in this example, but it should offer enough of an example to show the utility of this clever modification to SCRIPSIT.

letter word. It will always print with only one space. Another place where the required space comes in handy is when you want to be sure that a group of words appears on the same line. Since the group is seen by the program as one big word, it will print on the same line no matter how you format your text.

Other print control codes allow the printing of brackets ([ ]), braces ({ }), and carets (^). With some printers, *SuperScript* lets you toggle between ten characters per inch (10-pitch) and twelve characters per inch (12-pitch). Though you would normally set your type pitch at the beginning of the text, this, combined with the printout pause capability, lets you do some pretty fancy printing: You could start printing in 10-pitch, then pause the printer, switch type-wheels, change to 12-pitch, and print indented material with a completely different look than the main text (see Figure 1).

Directory and Kill Commands

SuperScript gives you many clever printing options, but the special commands available during text entry/editing will be used even more often, perhaps. These are the Directory and Kill commands, and add immense ease-of-use and power to Scripsit.

You can see the disk directory at any time by simply pressing the BREAK key (to put you in command mode) and typing "?D." The directory will replace the text on screen and will show all files with regular and "invisible" attributes (but not "system" files), plus an indication of the amount of disk space available in grans. Great, you say, but what happens to the text that was replaced by the directory? Press either the space bar or the ENTER key and the directory disappears, to be replaced by your text—even the cursor is just where you left it.

The combination of the Kill and Directory commands alone make SuperScript worth its price.

Killing files without leaving Scripsit is even simpler than killing them from DOS. Just enter the command mode by pressing BREAK, then type "K filename." The disk whirs in the drive and it's done. The beauty of this command is that you can make room for your text to be stored on disk without the Scripsit Catch-22: with unmodified Scripsit, you must exit the program—and thus lose the text—to make room on the disk for the copy you just lost! The combination of the Kill and Directory commands alone make *SuperScript* worth its price.

When Radio Shack first released Scripsit, there was a tremendous flurry of interest among business people. The furor was quickly dampened, however, when people discovered that the limitations of Scripsit were simply unacceptable in a business environment. Had *SuperScript* been available at that time—and recommended by Radio Shack personnel—sales to the business and professional communities would have increased significantly.

Disadvantages

But is everything about *SuperScript* just peaches-and-cream? Well, almost. There are some areas that could stand improvement. The program documentation, while very complete, is not easily digestible by computer novices and needs to be read a couple of times before it can be fully understood. I would dearly love to have seen included a separate card with a summary of the new commands and control characters. A set of stickers to use in labelling the new control keys would also be nice. It's little touches like these—however trivial—that make life easier for the end-user of a fine product like *SuperScript*, especially if that end-user is not a computer hobbyist.

Summary

All told, *SuperScript* represents a very significant improvement over Radio Shack's unmodified Scripsit. But even amid this wealth of added capabilities, there have been a few perfectionists who still suffer from the dread "if only..." syndrome. To satisfy them, Acorn Software will be releasing an expanded (and more expensive) version of *SuperScript*. It should be available even as you read this review, and will include user-defined special characters and control codes; variable repeat speed; automatic saving of the window width, tab stops, and paragraph indentation settings; an indication of how many grans of disk space will be needed to save the current text; and the ability to load both Scripsit and the desired text file directly from DOS by typing "SCRIPT filename."

Additionally, Acorn will include a separate program titled, appropriately, "OOPS." This little gem will allow you to recover all or most of your Scripsit text after you accidentally press the reset button, issue the "END" command, or if the system "hangs up" for just about any reason before saving your copy on disk.

If you don't need the extra bells and whistles, the original version of *SuperScript* continues to be a super bargain at $29.95. On the other hand, the combination of Radio Shack's Scripsit and Acorn Software's expanded *SuperScript* promises to be a word processing system that will be hard to beat at any price. □

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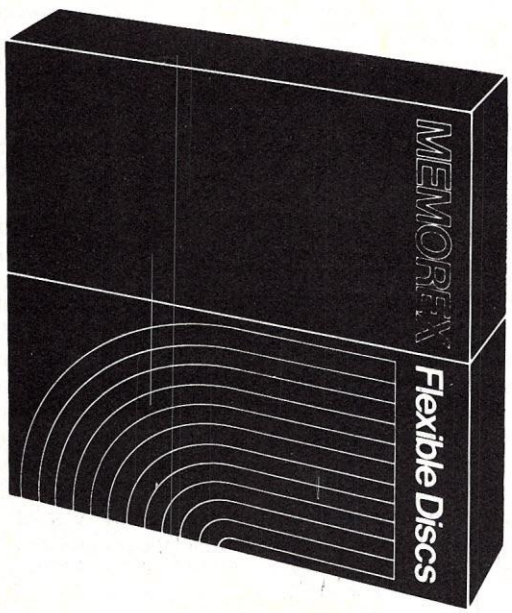

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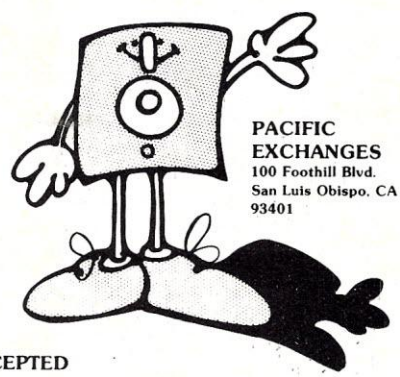

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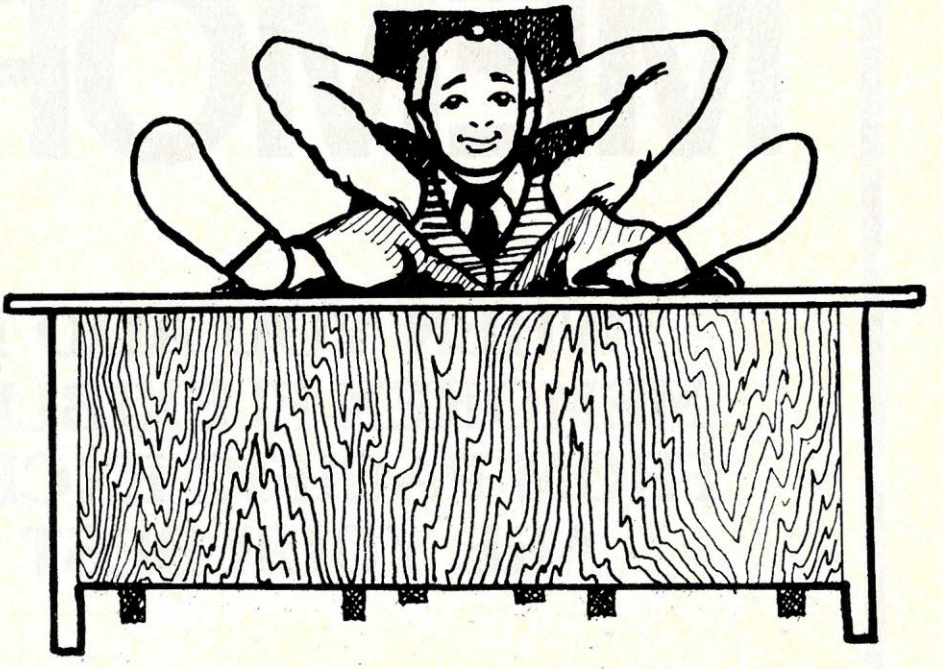


Lazy Writer

George Bond

creative computing
SOFTWARE PROFILE

Name: Lazy Writer
Type: Word Processing
System: 32K Model I TRS-80, Disk Drive
Format: Disk
Language: Machine Language
Summary: Very easy to use
Price: $125
Manufacturer: SSM, Inc.
6250 Middlebelt
Garden City, MI 48135

This is being written on a TRS-80 Model I computer with ease and flexibility that previously had been available only on larger computers with much more expensive word processing programs. What has moved the Model I up into at least the Triple-A League, if not the true Big Leagues, of writing is a modestly priced word processer called Lazy Writer.

The best thing about Lazy Writer, from the viewpoint of a professional writer and editor, is not that it does exotic things, undreamt of by users of Electric Pencil and Scripsit. It is that it does the same things in a much simpler way.

Gone is the vexing problem of how to get a control key on the minimal keyboard of the TRS-80—control keys are not needed. More important, gone is the need to remember what the control key does, or to stick those sticky little reminder labels on the keys. And gone is the need to have the manual dexterity of a Mississippi River cardsharp to manipulate control-shift-character key combinations.

George Bond, 328 8th St. SE, Washington, D.C. 20003.

The program comes on a TRSDOS disk, which can be backed up as many times as necessary. Lazy Writer can also be run using the Dosplus 3.3D double-density operating system with a Percom Doubler board in the expansion interface. It also seems to run with the Percom DBLDOS system (which comes free with the doubler board), but I have not checked this combination extensively yet. Unfortunately, it will not work with NewDOS80 and DoubleZAP/II for double-density operation.

After booting the disk, the main menu for the program is loaded by pressing the "L" key. The main menu gives the choice of starting in "Text Entry" or "Edit," or to recover text from memory.

Switching between Text Entry and Edit is the key to Lazy Writer's simplicity. To switch from one to the other, you need only press the break key. The 15th line of the screen carries a message noting that the program is in Text Entry and the break key will move it to Edit. The 16th line in Text Entry lists the number of characters in your text, the maximum number of characters your computers memory can handle, the location of the cursor and the length of the line the cursor is on.

Entering Text

To write, start the program in Text Entry and begin. The only basic differences from writing on a typewriter are that instead of using shift-lock (which doesn't exist on the TRS-80 keyboard) to stay in capital letters, shift-clear is used, and the right-arrow key provides a five-space indentation after the enter key marks the end of a paragraph. That's it, all you need to know about Lazy Writer for bread-and-butter banging out of The Great American Novel.

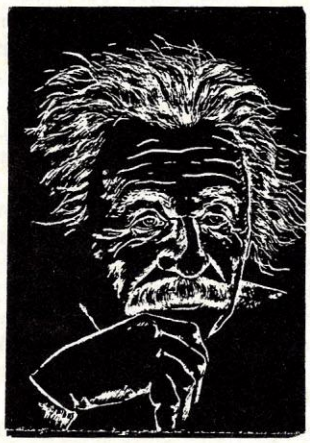
Things are a bit more complicated in Edit, but not much. Typing "H" calls up a help file, which explains in detail what functions are available and how to use them (and you can add your own messages to fill in any personal blind spots about the system's operation).

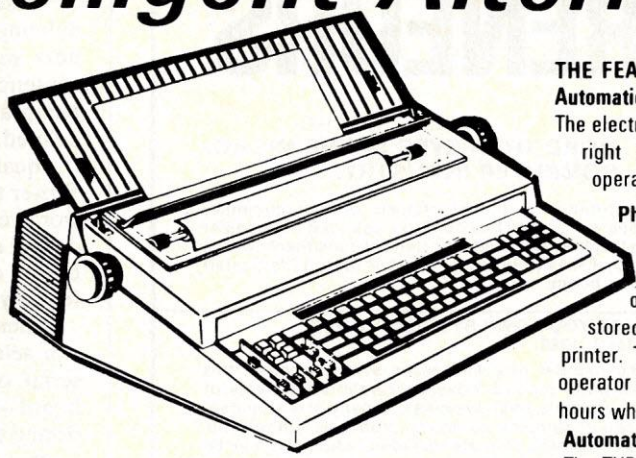
The screen remains split in Edit, but the 15th line become a dashed separator and the 16th line tells only cursor position and line length, until one of the editing commands is used. Then the 15th line disappears and the function—"INSERTING," "DELETING," etc.—is printed as the 16th line.

The editing commands are extremely simple: "i" to insert, "d" to delete, "o" to overtype, "c" for change case (to make "DOG" into "dog" type the lower-case c over the D, O and G and there it is). Pressing the enter key makes your changes permanent; pressing break cancels them. The cursor can be moved up, down, right and left as usual with the arrow keys.

One of the really nice features of Lazy Writer allows skipping the cursor from word to word by pressing the space bar, sentence to sentence by pressing the period (".") and paragraph to paragraph by pressing the lower-case "p." The cursor can be moved backward in the text by using the shift key and the space bar or period.

An Intelligent Alternative





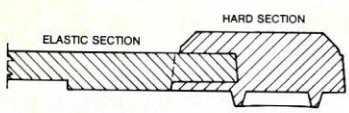
TYPRINTER 221

In the research you are doing before purchasing your computer printer, you are probably confused by the various claims, speeds, choices, shapes and prices. Well, we'd like to clear the air a bit and tell you about the most unusual computer-printer around — the TYPRINTER 221.

You see, it's unusual because it is **totally compatible** with **every** computer and word processing program . . . from the largest to the smallest. It's versatile to the point of incredibility . . . We'll discuss the broad advantages and explain the details.

THE DAISY WHEEL

The special daisy wheel supplied is of a unique design consisting of a 100 character carrying radii. Each radii is formed of two distinct types of plastic — an "elastic plastic" for the stalk of the radii, and a comparatively "hard plastic" used to form the character area. This, combined with a very narrow character profile and a special positioner on each of the 100 radii, guarantees a uniform character density. There is near perfect geometric positioning of the character with no character higher or lower than the others. And because of its unique dual material design, microvibrations have virtually been eliminated, leaving your final copy clean, clear and smudge free. The copy produced is comparable to that produced by metal daisy wheels and at a fraction of the cost.



THE KEYBOARD

The keyboard has been referred to as a triumph of human engineering - from the way the keys seem to have been custom designed to fit your fingers, to the way the special feature switches have been grouped. A flip of a switch (or under computer control of course) and the. printer becomes a foreign language machine. Push a button, and like magic the printer automatically locates and lines up columns of figures, perfectly balanced between the margins. This incredibly fast, extraordinarily quiet electronic keyboard puts more programming power at you fingertips then printers costing five to ten times as much.

THE DISPLAY

The TYPRINTER 221 presents a new dimension in operator/machine communications. In the manual (typewriter) mode, the printer controls and verifies all entries before printing. The display exhibits the last 15 characters of the text, word-by-word, until the end of the line. The operator may control what will be printed before the actual printing takes place. This new found flexibility enables you to make modifications along the entire line and in both directions. This 20 character plasma display has the ability to scroll backwards as well as forwards; will give the operator a visual indication as to which print mode is currently being selected as well as the number of characters remaining before the right margin is reached. The display will also indicate to the operator:

- The number of characters available in the memory.
- When the printer is in an error condition.
- When a pre-programmed form layout has been selected.
- When the printer is operating from the internal memory.
- What characters will be inserted into an existing text.
- When the memory for the previous line has been selected.
- A warning message that the end of the page is being approached.
- That a hyphenation decision must be made.

PRINT MODE

The TYPRINTER 221 will allow you to automatically highlight individual characters, words or complete sentences. Whatever is entered from the keyboard or from the computer, even an existing text file, can be printed in one or more of the five different modes:

- traditional printing;
- underlined characters;
- true bold characters where the horizontal component of the character is increased without disturbing the vertical component;
- characters which are both bold and underlined, and;
- a feature unique among computer printers-printing in reverse — white on black, sort of reverse video on paper.

MULTILINGUAL CAPABILITY

A unique and useful feature of the TYPRINTER 221 is its capability of being able to print in several languages without changing the daisy wheel. In addition to English, every standard daisy wheel has the ability and the necessary characters to print in French, Spanish, Italian and German.

THE FEATURES

Automatic justification of the right margin
The electronics of the TYPRINTER 221 have made right hand justification a simple, automatic operation.

Phrase and format storage
Phrases. dates, addresses, data, etc. that may be stored in your computer's memory may be sent over to the printer and stored in one of the "memory bins" of the printer. This information may then be used by the operator in the manual mode. This can save you hours when trying to get a form "just right."

Automatic centering
The TYPRINTER 221 will not only center any title between the pre-set margins, but will also center over one or more columns, or over any specific point and will even align copy with the right margin independent of the left margin.

Automatic vertical lines
A command from the computer enables an automatic feature which prints vertical lines at any point on the paper.

Automatic tab sequence recall
With the TYPRINTER 221 you may store and recall the most frequently needed margin and tab sequences for applications such as daily correspondence, statistical reports, etc. This guarantees consistent high quality appearance of each document.

Paragraph indent
A computer command instantly sets a temporary margin in order to print one or more indented paragraphs with respect to the right margin.

Automatic decimal point location
No matter how many figures to either the left or right of the decimal point, the TYPRINTER 221 will automatically line up the figures with the decimal point in any position you choose. Statistical printing has never been easier.

Column layout
This feature allows you to obtain automatic and perfect distribution of spaces between columns in respect to the margins. A perfect page balance is assured without the need to carry out calculations or additional operations.

There is a wide variety of options that you can add to TYPRINTER 221.

By now you are probably convinced that **we are sold** on our machine, and we hope you can understand why. In fact, why don't you use these facts to measure against any and/or all the other computer printers on the market.

When you do, you will realize the TYPRINTER 221 is an intelligent electronic typewriter, a text formatter — and a brilliant computer printer — available at a suggested list price of only $2850.

TYPRINTER 221 is available at your local computer shop — or we'll tell you where you can see and try one if you call us at

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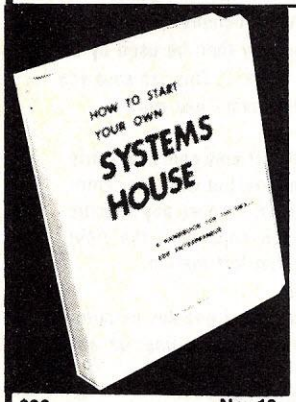

HOW TO START YOUR OWN SYSTEMS HOUSE
6th edition, March 1980

Written by the founder of a successful systems house, this fact-filled 220-page manual covers virtually all aspects of starting and operating a small systems company. It is abundant with useful, real-life samples: contracts, proposals, agreements and a complete business plan are included in full, and may be used immediately by the reader.

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by Leslie Nelson, 2nd revised edition, Jan 1981

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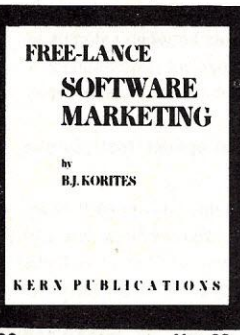

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Lazy Writer, continued...

These same functions can be used when deleting—"d" and space bar erase the next word, "d" and "." erase the next sentence, "d" and "p" erase the next paragraph. Single characters can also be deleted.

Equally simple commands allow Lazy Writer to search for strings of characters, words or strings of words; to search and delete; and to search and replace. Moving blocks of type is easy, too, and requires few keystrokes.

When using the print functions—you can select standard Centronics parallel, serial or special drivers from the keyboard—there are two choices for establishing the format of what you print.

The simpler method is to use a menu that appears when the print function is selected. Using the menu, you can change margins, line spacing, page length and such, as well as order multiple copies of your printing.

The more complicated method of entering printing instructions requires putting them directly into the text—"imbedding" them. This has several advantages, chief among them that the commands are permanent. This means that if you need to send out promotional form letters, for example, with some regularity, they will be uniform in appearance without any extra effort by you after the initial set-up. You also can imbed commands to tell your printer—if it is capable of doing so—to switch to double-wide characters, underline, overstrike for bolder letters, change line width and margins in the middle of text, and work all sorts of graphic magic. With enough patience, you could even set up little indented boxes for later insertion of illustrations.

Another nice feature of Lazy Writer is an auxiliary program to send what you write over telephone lines (using, of course, an RS-232 port and modem) to other computers. It also allows taking a read-only look at files from disk—in effect, listing them as you would from the DOS level—without leaving the editing program or destroying text in memory.

Documentation

All the functions of Lazy Writer are covered well in its documentation, which ranks among the best I have seen. It is on a par with the construction manuals for Heathkits and Dynakits.

Finally, a covering note in the documentation from Dave Welsh, who wrote Lazy Writer, bodes well for its future: "We view widespread misunderstanding (of how to use the system) as a program or a documentation fault to be corrected if possible."

If more authors, and computer people in general for that matter, would take such an attitude, life among the bits and bytes would be infinitely more enjoyable. ☐

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** Denotes New Program

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CIRCLE 205 ON READER SERVICE CARD

Getting It Together on the TRS-80

Bill Horvath

Radio Shack is finally beginning to put all of the pieces together! I discovered this recently when converting my old faithful 4K Level I into a 16K Level II machine outfitted for word processing.

My Level I had served me well in the 15 months since I originally purchased it to "give it a try." I considered it paid for not long into its life when it did wonders (with the help of Radio Shack's Math I program and some efforts of my own) for my seven-year old son who was having considerable difficulty comprehending fundamental math relationships.

The Decision to Upgrade

My work as a consultant, with increasing demands for reports and documents, led to my decision to upgrade. As a start, I pored through the most recent Radio Shack flyers and catalogs as well as the current personal computer magazines.

I developed my shopping list:

1 16K-Level II conversion (without keypad)

1 Lower case mod

1 Scripsit word processor (tape)

1 Line Printer II with cable

Assorted items such as tapes, ribbon, and extra paper.

I would also ask for the cassette-tape-loading modification to the board, the KBFIX tape to eliminate keybounce, and the mod to my CTR-80 cassette recorder (manufactured before March of 1979) to eliminate the possibility of glitches on the tape if the recorder was stopped for some reason during the save or load process.

My first visit was to the local Radio Shack outlet. No, I was told, you must purchase the keypad with the Level II modification! Since my exclusive use of the computer would be in wordcrafting, the added baggage of the keypad on my board would be next to useless.

Bill Horvath, 2459 Haymaker Road, Monroeville, PA 15146.

Since the regional Radio Shack Computer Center was not too many miles distant, I decided to visit before placing an order. "Yes," I was told, "we will install all of the mods without the keypad." (Savings: $79 for the pad plus $15 for installation.)

A few days later, I dropped off my 4K board and cassette deck. It was a Wednesday morning. The following afternoon I received a call that all was ready and could be picked up the following morning.

The Store Visit

Bright and early Friday morning, I arrived at the Computer Center to pick up my modified equipment. Before I made a decision on purchasing the Line Printer II, would I look at the new Line Printer IV which had just arrived from the warehouse? Indeed, I would. The demonstration proved that the printer had surprising capabilities. Yes, indeed, I would be very interested in the new printer, since I had saved nearly $100 by eliminating the keypad installation! It turned out to be a very good decision, as I will outline later.

What about my KBFIX tape, I asked? No longer needed, was the reply. Everything was handled with the modification.

OK, I replied, somewhat skeptically, checking to be certain all my manuals and conversion tapes were present before I left the store.

The Home Experience

Back home, I plugged all the components together and powered up the computer. An immediate shocking discovery! Memory read 15770 for 16K rather then the customary 15772. Was there a defective chip? Panic set in! A quick call to the Radio Shack Computer Center provided an answer and alleviated my anxieties.

In its latest conversion kits, Radio Shack is using a new ROM that reduces free memory space by two bytes. But this is certainly a welcome tradeoff for what the new ROM accomplishes, including an end to frustrating keybounce and cassette loading problems.

With the latest ROM you get MEM SIZE? on power up. Assuming you do not wish to protect any memory and push "Enter," the computer comes back with "R/S L2 BASIC" and the familiar "READY ." From here, you can type in "SYSTEM" and load machine language or go directly to Basic.

The new ROM also provides a number of other features such as the outputting of control characters, performing multiple "Print @s" using a single print statement, and the ability to specify file name using CLOAD under disk basic.

That was the good news, now the bad. If you have a second tape drive with Expansion Interface, you can now only CLOAD or CLOAD? with tape drive number 1. At least ten older Radio Shack programs—including MicroChess, Algebra I, and Editor/Assembler—may not load properly with the new ROM because of timing of the material on the tapes. Further, the new ROM is not directly interchangeable with the old—requiring you to shell out $150 for a new kit if you are interested.

Nevertheless, my reborn Level I hasn't changed its personality with the new mod. The occasional keybounce I once encountered (remedied with a dab of alcohol on a cotton swab, is now completely absent. Best of all, the cassette recorder thinks it is still feeding the Level I baud rate. I have tried a variety of tapes from my own to Radio Shack's to other software producers'. No problems! With the new mod, it's a case of set it and forget it.

THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™* MICROCOMPUTER

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Living with Lower Case

Radio Shack's lower case modification requires entering a machine language driver program from tape or disk before writing or running your own program utilizing lower case. Once you've loaded, you are ready to operate in normal Basic.

The modification manual warns that non-Radio Shack software may not load properly with the mod installed, and lists two of their own programs (Accounts Receivable and Level II Cassette Payroll) that won't work either. No doubt the problem is a memory-space clash—the mod uses the area of 32208 to 32767.

However, I have loaded a number of programs from various sources and have yet to note a problem. My advice is simple—make sure that the software you purchase won't run into the memory space area reserved if you have the upper/lower case mod installed.

No matter how fast I went, the computer and screen kept up. Nowhere was there any sign of keybounce.

Adventures with Scripsit

Scripsit, the Radio Shack word processing system, has the lower case driver included. Lower case is invaluable if you intend to do any serious word processing and have a printer capable of printing lower case. One of the best features are the "below the line" descenders which make the text on the video display very easy to read.

The tape version takes about four minutes to load. I find no difficulty with this, as it allows me time to organize my notes—and my thoughts—before beginning work. Once the machine language tape is loaded, you bring up the lower case by pushing the control (@) key and shift key at the same time. I have found this to be a somewhat tricky proposition sometimes requiring several tries.

Before beginning a letter or document, you enter a format line providing such instructions as lines and paragraph spacing, width of text, and whether or not you want the copy justified. From that point, you can begin writing text.

Although I've worked for years with manual and electric typewriters, this was my first experience with electronic word processing. It was a pleasant surprise! I am a fairly speedy typist, and the keyboard (the older TRS-80 version) felt very good to the touch. No matter how fast I went, the computer and screen kept up. Nowhere was there any sign of keybounce. Once in a while I would glance at the screen and would see the computer pause a fraction of a second before displaying a letter. I figured it was trying to discover what my flying fingers were up to on the keys—but it was right every time!

It took me less than an hour to learn the basic workings of Scripsit. At that point, I was able to turn out a decent-looking letter addressed to a friend. I realize that Scripsit holds a great deal more potential and have begun working with its manual and recorded lessons to

IN ANY WATER SOLUTION $[H_3O^+]X[OH^-]$ ALWAYS EQUALS 10^{-14}

Bi-Directional Printing allows the use of superscript and subscript.

Line Printer IV Character Styles.

```
PROPORTIONAL NORMAL

 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~
```

```
PROPORTIONAL ELONGATED

 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVW
`abcdefghijklmnopqrstuvwxyz{|}~
```

```
10 CPI NORMAL

 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~
```

```
10 CPI ELONGATED

 !"#$%&'()*+,-./01234567
@ABCDEFGHIJKLMNOPQRSTUVW
`abcdefghijklmnopqrstuvw
```

```
CONDENSED (16.7 CPI) NORMAL

 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~
```

```
CONDENSED (16.7 CPI) ELONGATED

 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~
```

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6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
NAME	**DESCRIPTION**	
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
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75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
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CIRCLE 137 ON READER SERVICE CARD

gain as much skill as I can in using all the program features.

With my 16K machine, I am able to run roughly three double-spaced pages of text before running out of memory space. So, with my longer documents, I simply dump the text to tape, give a command to erase text from beginning to end, and begin again without having to reload Scripsit.

The only disadvantage here is the inability to move paragraphs any significant distance within the document.

There are a few frustrations. Although you can request the computer to give you a reading on remaining text memory space, it is a bother. You may be down to the last few words of a paragraph when the computer signals "NO MORE ROOM." I do wish for a signal that might tell me "FIVE MORE LINES" to help me to conserve space in wrapping up the material.

Another oddity is the occasional sudden dropout of lower case—usually while I am in an editing or special command mode. At this point, no matter what efforts I put forth, I am unable to bring lower case back short of reloading the program. I suspect I am accidentally hitting a wrong key combination when this occurs. I hope Scripsit developers will provide a more "fail-safe" protection for lower case in future versions.

Line Printer IV

I have saved the best for last. Radio Shack's Line Printer IV (a Centronics 737 in disguise) is a truly versatile machine and a perfect companion for the TRS-80 equipped for word processing.

When I went shopping for a printer to go with my upgraded system, I looked at several in the $800 to $1,000 bracket. Among them were the Anadex (of the infamous purple ribbon), the Paper Tiger and the Okidata. The latter two incorporated graphics capabilites. They were all well-designed machines, but I decided to stick with tried-and-true Centronics and its Radio Shack version, Line Printer II.

What concerned me most about Printer II was its inability to produce true lower case descenders. Especially irritating were the tiny "Q" and the miniature "G"—simply upper case letters reduced in size. I realized that it might make proofreading a nightmare.

Nevertheless, I made it my first choice based on the Centronics' reputation for reliability and service. But as luck would have it, the updated Line Printer IV arrived at the Radio Shack Computer Center at the same time as I did.

The Line Printer IV is the same size and shape as its predecessor, but there is a great deal more on the inside, and its cost is the same as Printer II's was only a short time ago.

First, there is a new dot-matrix print head that can form up to nine vertical and six to eighteen horizontal dot placements, in contrast to Printer II's 7 x 7 head.

The result: three basic type styles, each with an elongated version, plus the capabilities of underlining, bold or overprint characters, superscript and subscript. The three basic styles are normal (ten characters per inch), condensed normal (16.7 cpi), and proportional. Each of these styles may be printed in an elongated version.

Although many users will prefer the normal face for most applications, the proportional text is a very clean and easy-to-read face, difficult to distinquish from the faces on some of the finest electric typewriters.

When using Basic, it is simple to shift from one print mode to another as your text needs change. As an example, the command "LPRINT CHR$ (27); CHR$ (14)" will instruct the printer to select the proportional characters rather than the normal.

After using Line Printer IV, I consider it to be the finest of its class.

Scripsit, on the other hand, will only permit selection of the character format once. When using Line Printer IV with Scripsit, any special function control command must be entered in Basic before typing "SYSTEM" and loading the Scripsit tape. The only way to change is to turn off the computer and reload the word processor—an effort I would make only in the most dire circumstance. I hope that later versions of the current Scripsit (Version 1.0) will allow the user to take full advantage of Line Printer IV's capabilities.

The printer has three controls located at the bottom of the front of the case. At the right is the on-off power switch. On the left-hand side are the ON LINE/LOCAL and PAPER FWD/REV controls.

When powering up or down, the left control should always be in the "local" mode to avoid any stray signal input from the computer. The switch must also be in this position if you wish to move the paper manually using the paper feed control. The two controls, used in conjuction, make paper handling a breeze. Also, if you should have a paper jam, throwing the right lever into "local" allows you to fix things without losing characters already in the printer's buffer.

Printer IV uses the same Möbius-loop ribbon-tray system as its forerunner. I do suspect that, despite occasional loading problems, you can use a great deal more ribbon this way in contrast with the traditional reel-to-reel method.

There is still the convenience of three paper feeds—roll paper, fan-fold, or single sheets. Alas, some improvements have been neglected in the transition of Printer II to Printer IV. The power-on LED indicator light is hidden deep in the innards of the machine, visible only through the upper paper slot (if you look carefully and in the right direction). On the first day the printer was in residence, I powered down everything else but missed the printer, which sat with power on for two hours. It could have been days or weeks! Please, Centronics folks, place the LED so it shows on the outside of the case.

The print-head guide also remains a problem. Single sheets and roll paper must be positioned very carefully when first loading. Otherwise, there is a tendency for the print head guide to snag the edge of the paper as its begins its rightward travel. Anything from small nicks in the sheet to torn sheets and snagged print heads can result.

The print head itself contains a four-position lever accessible by opening the top cover. The load position is used to retract the head while inserting paper. The user can select the other positions—1, 2 or 3—depending on thickness of paper, number of carbons (maximum of about three), or heaviness of impact.

The plastic "tear-off" strip, part of the top cover, leaves something to be desired when separating roll paper sheets. To get a clean cut, you must act gingerly, using a finger to keep a straight cutting edge. I've tried a quick-tear method, but this usually results in moving the paper from its straight-and-narrow path—which then requires paper repositioning.

I consider these to be very minor faults. After using Line Printer IV, I consider it to be the finest of its class if your main objective is word or number output. As of now, its features, with respect to paper variations, type styles and printing modes are unequalled.

For years I have worked at electric typewriters whose motors and gears constantly whirred. As I pressed each key, there would be a mechanical clank of machinery in motion. Now, there is only the sound of the keyboard as I type. The printer sits quietly until I am ready to use it. And when I am, it simply purrs away quickly, quietly and efficiently—and the job is done.

Satisfied with my upgrade to Level II, Line Printer IV, and word processing? You bet! □

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SOFTWARE PROFILE

Name: The Executive Secretary

Type: Word Processor

System: 48K Apple with ROM Applesoft, Disk Drive, lower case adapter or 80 character card

Format: Disk

Language: Applesoft and Machine Language

Summary: Easy to use, ideal for professional writers

Price: $250

Manufacturer: Personal Business Systems, Inc.
4306 Upton Ave. South
Minneapolis, MN 55410

Let me make one thing perfectly clear: this will eventually become a review of a word processing/card file/electronic mail program for the 48K Apple II Plus or Apple II with Applesoft in ROM or a language card. The program will store about 25,000 words on a disk (30,000 on DOS 3.3).

First, however: a recent article on word processing (April, 1981, *Writer's Digest*) really made me sizzle. Writer Robin Perry proclaims "A home computer is a sophisticated toy used for games and such things as budgets, keeping track of stocks, and the like." Perry next grouped the Apple III with the Atari, PET, Heathkit, and the TRS-80 Model II calling them "some of the better-known home computers that have limited word processing capabilities."

In a sidebar, Perry says "...I feel safe in recommending specific machines to you." All of them are between $6,000 and $10,000. The list includes the Apple III, the TRS-80 Model II and the Zenith/Heathkit Z89.

Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.

The Executive Secretary is reasonably simple. Considering the options it has, it's amazingly simple.

Further, Perry touts letter-quality printers for $3,000-$4,000 over $1,000 dot-matrix machines. "...the difference in price is worth it."

I emphatically disagree with Robin Perry.

Exhibit A: I am a freelance writer fulltime. Last year I sold over 175 newspaper and magazine articles to a variety of trade and consumer publications, from *Women's Wear Daily* to *Nibble*.

Exhibit B: In my office is an Apple II Plus, 48K single disk drive, MPI 88G dot-matrix printer, and a black and white video monitor. The Apple operates superbly, and has, for the most part, ever since I acquired it about it a year ago. No editor has yet complained of my dot-matrix typeface.

Exhibit C: My total system, with The Executive Secretary word processing system ($250 from Personal Business Systems, Inc., 4306 Upton Ave., So., Minneapolis, MN 55410) cost less than half what Perry recommends. And I love it. Besides, I'd like to see Perry play Starfleet Orion on his/her Olivetti 401.

But it's possible I'm spoiled. This is the only word processing program I've ever used. I feel rather like a race car driver who's putting a test car through its paces: I work it hard in a variety of ways.

Designer John Risken gave me the uncopyable program, and installed the necessary Dan Paymar lower case adapter so that I could try it out and write about it. Bless his soul!

The $250 price tag may seem a bit steep, but consider that this program is a word processor plus form letter generator plus electronic card catalog plus report writer plus electronic mail option all in one.

Understand, please, that I am not a technical person. I am a writer. I don't have time to mess around with anything too complicated. The Executive Secretary is reasonably simple. Considering the options it has, it is amazingly simple.

Unlike some other word processing programs I've looked at for the Apple, The Executive Secretary will operate with the 40-character display and a Paymar chip; or it will use an 80-character board from Bit 3, the Smarterm from Apple, or Videoterm from Videx. The program allows either one disk or two, and can be changed to reflect new purchases.

It will support a variety of printers, parallel or serial, from the Silentype to Qume/Diablo/NEC for bidirectional printing. It will even operate the IBM ET Series typewriters.

There are 76 pages of instructions, 8 1/2 by 11", in a secretary's binder that stands next to the machine. There's also a prompt card that fits across the front of the Apple.

When you first boot The Executive Secretary, the program asks you to answer

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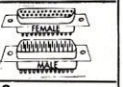

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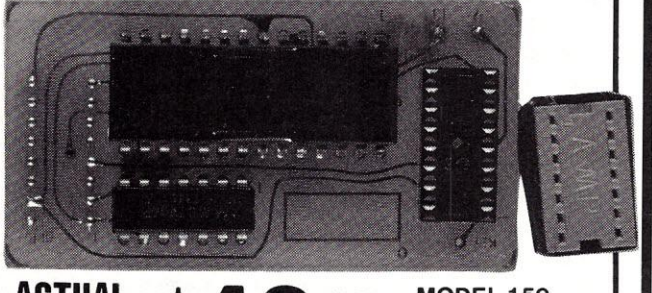

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CIRCLE 146 ON READER SERVICE CARD

some questions. This adjusts it to your equipment.

The Commands

Beginning to type on an Executive Secretary-initialized disk is done just by typing the letter A. In place of the inverse asterisk that signals the editing mode, a short one-character underline appears. On my 40-character screen, the letters appear just as they will on the document: upper and lower case. As you type, of course, the words automatically wrap around to the next line.

Across the top of the screen reads the name of the document you've selected. Under that in inverse letters it proclaims "TYPE!" LEFT ARROW ERASES. 'ESC' ENDS." Hit Escape, and you're in the Edit mode. This allows you to move from line to line, page to page, or front to rear of the document. At the top of the screen, the inverse legend changes to "(A)DD (D)ELETE (M)ARK (P)RINT (ESC)APE."

Simply hitting A shifts you back into the Type mode. The letter D deletes one character or space to the right of the cursor. Shift D deletes a word. Control-D removes the entire line.

The character M marks three or more lines of type to move, delete, or treat as a Subfile. For example, in a lawyer's office there are often entire pages of "boilerplate"—language that must be put into contracts. Using The Executive Secretary, these could run 3400 words long, yet be inserted just by typing, at the left margin, > sf SUBFILE or whatever name you've assigned.

Also while in the edit mode, it is possible to run a single or double spaced rough draft, line numbered or not, by touching P and answering three questions.

Other edit options include going to the numbered line selected, and a global search and replace.

Hit Escape a second time, and the latest version of your work is saved on disk.

It asks you whether you want to save the new version under the original name, under a new name, or not at all. So typing six letters on the same subject to various people is simple. Just change the addresses and names, then save each version under a new file name. Or you could type > xt NEW PERSON at the address space; as the printer arrives at that spot on the document, it would go to eXTernal file NEW PERSON and insert the correct name and address into the document. (This is for those with only one disk drive. More on this later.)

Printer Commands

The Executive Secretary uses mostly two-letter mnemonics after the right karat (>) to give commands to the printer. (For standard-sized documents, there's a ready-to-go command already set when you want to print.)

But you can customize documents as well. For instance:

- Mark Addresses to print out on envelopes after the letter is printed;
- Advance horizontally and vertically to specified places on pre-printed forms;
- Print documents to allow for bindings, with wider margins on the left side of odd-numbered pages, on the right side of even-numbered ones;
- Set left margin, top margin and bottom margin;
- Run page headers incorporating page numbers, description, etc.;
- Have abbreviations up to a line long, and insert them by typing .TE, for instance;
- Center on and center off;
- Use tabs;
- Indent;
- Have Justification on or turn justification off;
- Change a counter for things like objects or page numbers, where something else might be inserted in a sequence;
- Give special commands tailored to the particular printer, such as subscripts, superscripts, boldface or shadow printing;
- Underline if your printer is capable of doing it.

In fact, Risken seems to be adding new ones constantly.

Electronic Card Files

You can set up files with as many as 13 lines. An empty disk will hold close to 500 of these individualized cards, depending upon whether you use 13 or 16 sector disks. You assign a name to each line you want to use to get up your file. Once your master list is completed, you can sort it in alphabetical or zip code order by any line, rename lines, print mailing labels, even reports doing subtotals and totals.

The Data Factory from Micro Lab will also work with The Executive Secretary.

Form Letters

If you have two disk drives, you can draw information from the card file to print customized letters. There are special commands to the card file that mean certain subfiles will be placed into a document if something is so and something else is so, but not if something else is blank. The program will also change the all-caps structure of the address label into a regular upper and lower case name, if desired.

Visicalc Option

For those who would like to incorporate Personal Software's Visicalc formatted reports into a document, it can be accomplished with The Executive Secretary.

Conclusion

As I say, this is the only word processing system I've ever operated for any length of time. I've used it (and misused it, Risken would swear) practically every day for the last five months in as many ways as I could dream up. I have yet to lose a file of any length, although many of my word changes, line shifts, paragraph moves, etc., have caused words to drop out—as many as three lines. The latest copy of it doesn't seem to be as bad.

It doesn't have a mathematics mode, which at least one word processor does. There is one solder connection to be made for the shift key, which voids the Apple warranty. The photographs showing how this soldering job is done are terrible. And at times, when you have a variety of documents, the printer program must be fiddled with.

Overall, though, those are the only problems I find with The Executive Secretary. It is an example of the quality of the program that I can find so little even to nitpick about. It is a powerful piece of design work that can make life easier for anyone who deals with words. Risken continues to upgrade it, and promises to add further connections to other software from other firms. □

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CIRCLE 144 ON READER SERVICE CARD

ower case plus

Leigh Goldstein

Move over Dan Paymar. There's a new kid on the block and he wants your lower case conversion business from all Apple II and Apple II Plus owners. As most of you know, the Paymar lower-case conversion has been the most widely accepted method used by Apple owners to get lower-case letters out of their machines. Being a fairly new Apple owner (four months), I was tempted by the ads I had seen in the various magazines for the Lazer System method. I sent away to Consumer Computers Mail Order, and received the kit in seven days.

Inside the box I found a software disk and the printed circuit board that was to be installed in the computer.

On my first glance through the manual I came across the word "solder," and immediately panicked. The last time I tried to solder something, I ended up spending $100 to replace the whole item. Fortunately for me though, my Apple is the latest revision, and the kit I received was specifically designed for it. If you have one of the older Apples, you must specify this fact when you order the kit.

The Apple keyboard was not constructed to allow you to enter lower case to a CRT screen. After you install the lower-case board, you must boot the software disk, which contains the programs to allow the Apple to ouput lower case. To use lower-case letters you hit the escape key twice. All typed letters will then appear in lower case. The escape key will now also function as your "shift" key. If you hold it down as you type a letter, that letter will appear in upper case. It takes a little getting used to, but it is not annoying.

In summary, I feel that the Lazer lower-case modification is well worth the money for the following reasons:

1. It is moderately easy to install; all you have to do is read carefully and stay calm.
2. The documentation is excellent.
3. It works with Pascal.
4. It is compatible with all the major word processing systems, including Apple Pie.
5. It is compatible with Mountain Computer's ROMPLUS/keyboard filter font editor (FEDIT) and their ROMWRITER EPROM programmer. This allows you to create your own fonts, view them in high resolution, and then save the font to disk.
6. It contains an expansion socket on the board which allows for future upgrades, and also offers another product called Graphics Plus—but that is another article.

My only real complaint with this system is the quality of the letter "m." It is not very sharp or clear. But that is really not a major complaint. I would not hesitate to recommend the Lazer System Lower Case Plus. It is an excellent product, and a very good value for the money.

Lazer Systems, P.O. Box 55518, Riverside, CA 92517. (714) 682-5268. $59.95.□

Leigh Goldstein, 328 E. 66 St., New York, NY 10021.

Why would anyone spend $59.95 for a joystick?

Super Joystick

Star Wars. Played with paddles, it's difficult at best and frustrating at worst. But with a joystick it becomes an entirely new experience. It's still challenging. It's also fun. And very addictive.

Have you ever used a drawing program in which one paddle controls the horizontal movement of the "brush" and the other paddle the vertical? It's slow, tedious work. But with a joystick, drawing is an absolute joy.

Exceptional Precision

The Apple high-resolution screen is divided into a matrix of 160 by 280 pixels. To do precise work on this screen, you need a precise device. Most potentiometers used in paddle controls are not quite linear. If you rotate a paddle control at a constant speed, you'll notice that the cursor speeds up slightly at the beginning and end of the paddle rotation.

The Super Joystick has a pure resistive circuit which is absolutely linear within one tenth of one percent. In other words it would give you precise control over an image of 1000 by 1000 pixels, were such resolution available. Thus it is suitable for high precision professional applications as well as educational and hobbyist ones.

Matched to your application

The Super Joystick also has two external trim adjustments, one for each direction. This allows you to perfectly match the unit to your application and computer. Say you want to work in a square area instead of the rectangular screen. Just reduce the horizontal size with the trim control.

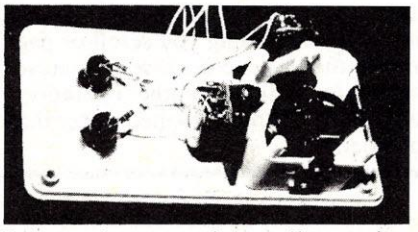
How many times have you played Space Invader and had your thumb ache for hours from the repeated button pressing? This won't happen with the Super Joystick. It's two pushbuttons are big. Moreover, they use massive contact surfaces with a life of well over 1,000,000 contacts. A few games of Super Invader using these big buttons will justify the purchase of the Super Joystick.

The Super Joystick is self-centering in both directions. That means when you take your hand off it, the control will return to the center. However, if you want it to stay where you leave it, self-centering may be easily disabled.

The Super Joystick plugs right into the paddle control socket and doesn't require an I/O slot.

High-quality construction

The sturdy metal case of the Super Joystick matches that of the Apple computer. Every component used is the very highest quality available. The Super Joystick even uses a full 16-conductor ribbon cable so you can add a second joystick if you wish. The first Super Joystick replaces Paddles 0 and 1. You may not realize it, but the Apple can support four paddle controls. A second Super Joystick would replace Paddles 2 and 3.



By removing two springs, self-centering can be defeated.

We invite your comparison of the Super Joystick with any other unit available. Order it and use it for 30 days. If you're not completely satisfied, return it for a prompt and courteous refund plus your return postage. You can't lose.

The Super Joystick consists of a self-centering, linear joystick, two trim controls, and two pushbuttons mounted in an attractive case. It comes complete with an instruction booklet and 90-day limited warranty. Cost is $59.95.

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CIRCLE 210 ON READER SERVICE CARD

A Very Smart Program...

The Paper Mate

G. R. Boynton

creative computing
SOFTWARE PROFILE

Name: The Paper Mate
Type: Word Processor
System: 16 or 32K PET
Format: Disk or Tape
Language: Basic
Summary: Good, inexpensive word processor
Price: $29.95 (Tape), $32.95 (Disk)
Manufacturer:
A B Computers
115 E. Stump Road
Montgomeryville, PA 18936

I am an aficionado of inexpensive word processors for the PET. I do a great deal of writing, and ever since I found out how easy it is on the PET I have been a fan. In searching for the "perfect" word processor I have investigated most of the not-too-expensive ones on the market. This is a review of the Paper-Mate by Michael Riley; a word processor written for the 16K and 32K 2001 series and the 16K and 32K 8000 series of Commodore machines.

Before describing this program I would like to give one overall evaluation. This is a very smart program. In addition to all the options there are many ways in which this program makes life easier for the user. One illustration: when loading or saving text the program begins by assuming that the user is employing a disk. But, if you use tape as I do, once you have instructed the program to use the tape drive it will continue with that assumption until you instruct it differently. It remembers what you did the last time. Now, this is not so important by itself, but it does indicate the care taken in the development of the program to make life nice for the user.

Any word processor must be able to perform the following operations: let you type text; let you edit the text that has been typed; let you save the text so it can be worked on later; and let you format the text for printing. In some cases this set of operations is split between two programs, a text editor and a formatting program. In this case text editing and formatting are combined in the same program.

There are two strategies for carrying out these operations. One involves the use of line numbers, and many of the operations center around sending the program to a given line for corrections, insertions or other operations. The other strategy lets you see what you are doing on the screen, letting you scroll or page through the text and use screen or cursor controls for editing and other operations. Paper-Mate is screen-oriented rather than line-oriented.

The program handles hyphenation in a very nice (and economical) manner.

Typing

Typing with Paper-Mate is straightforward. After the program is loaded, you tell it you want to write rather than edit, and begin typing.

The text is centered on the screen. The first and last columns of the screen are reserved for program operations, so the text appears in lines 37 characters long for 40-character screens and 78 characters long on the 80-character screens of the 8000 series.

While you are typing you can use the delete key to backspace and make corrections. You type continuously: just keep typing until you come to the end of a paragraph or other segment of text which requires a carriage return. By hitting the return at this point, a back arrow is left in the text, forcing a carriage return when the text is printed. When you are about to fill up memory with text the program says: 9 lines left; 8 lines left; etc. At this point it is time to save the text.

Editing

Anyone familiar with editing programs on the PET will find the most basic editing features of this program familiar: you use cursor controls to proceed forward or backward through the text. With the cursor controls you can go anywhere in the text. Then you can type over what is there, or use "delete" or "insert" to make corrections.

There are some extras, however. The cursor control characters have automatic repeating. Hold the key down for a half a second and the cursor goes scooting across the page. This little bonus is provided for all keys, not just the cursor controls.

You can page through the text. The "<" and the ">" are used to send you rapidly backward or forward through the text faster than is possible with the cursor controls.

You can transfer or delete a block of text or enter a blank line at a block in the text. First, you use "[" and "]" to define the block of text. Then you go to a menu (by hitting CLEAR), and type T (for transfer) or D (for delete) or I (for insert blank).

The formatting commands are extensive. Each begins with the "up arrow," and they can appear anywhere in the text. You can set left and right margins, and change them in the text as needed. You can set page size so the program will automatically skip to the next page on continuous paper, or have the printing pause while you insert a new piece of paper. If you want, the program will automatically print a header at the top of each page and a page number at the bottom of the page. There is a command for centering text and another for justifying text. And the list could go on.

Loading and saving text are done using the menu. Hit CLEAR and type either L or S. Then you are asked for the name of the file, and the device number to be used.

G.R. Boynton, Department of Political Science, The University of Iowa, Iowa City, IA 52242.

80 COLUMN GRAPHICS

The Integrated Visible Memory for the PET has now been redesigned for the new 12" screen 80 column and forthcoming 40 column PET computers from Commodore. Like earlier MTU units, the new K-1008-43 package mounts inside the PET case for total protection. To make the power and flexibility of the 320 by 200 bit mapped pixel graphics display easily accessible, we have designed the Keyword Graphic Program. This adds 45 graphics commands to Commodore BASIC. If you have been waiting for easy to use, high resolution graphics for your PET, isn't it time you called MTU?

The image on the screen was created by the program below.

```
 10 VISMEM: CLEAR
 20 P=160: Q=100
 30 XP=144: XR=1.5*3.1415927
 40 YP=56: YR=1: ZP=64
 50 XF=XR/XP: YF=YP/YR: ZF=XR/ZP
 60 FOR ZI=-Q TO Q-1
 70 IF ZI<-ZP OR ZI>ZP GOTO 150
 80 ZT=ZI*XP/ZP: ZZ=ZI
 90 XL=INT(.5+SQR(XP*XP-ZT*ZT))
100 FOR XI=-XL TO XL
110 XT=SQR(XI*XI+ZT*ZT)*XF: XX=XI
120 YY=(SIN(XT)+.4*SIN(3*XT))*YF
130 GOSUB 170
140 NEXT XI
150 NEXT ZI
160 STOP
170 X1=XX+ZZ+P
180 Y1=YY-ZZ+Q
190 GMODE 1: MOVE X1,Y1: WRPIX
200 IF Y1=0 GOTO 220
210 GMODE 2: LINE X1,Y1-1,X1,0
220 RETURN
```

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-Memory--RAM, ROM, EPROM, ETC.
-Peripherals.
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-Software buzzwords.
-An overview of the major computer languages--Assembler, FORTRAN, COBOL, PASCAL, PL/1, APL, ADA, C, FORTH, LISP and more.
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ABOUT THE INSTRUCTOR

The instructor for the course is Barbara Schwartz. The course lecture and workbook is all original material created by her. She is a consultant to major corporations and small businesses and is a writer on computer and data processing topics. She has taught courses for companies and schools in simple clear English.

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11 ☐ Government/Military
12 ☐ Hospital
13 ☐ Hotel
14 ☐ Industrial Design
15 ☐ Law Office
16 ☐ Management Consultant
17 ☐ Manufacturing
18 ☐ Personnel Agency
19 ☐ Professional Services
20 ☐ Research/Development
21 ☐ Transportation (All)
22 ☐ Utility
23 ☐ Wholesale/Retail Sales
24 ☐ Other (Please Specify) _____

Check your primary job function.

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9 ☐ Designer (All)
10 ☐ DP/WP Manager/Operator
11 ☐ Doctor
12 ☐ Engineer (All)
13 ☐ Lawyer
14 ☐ Office Manager
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Paper Mate, continued...

Printing

Printing the text has some rather nifty features built into it. You go to the menu, and type P. You are asked if the device number is 4; you can change it if it is not. Then it asks if it is the Commodore printer, and, if not, whether a line space command is necessary, and whether the interface translates PET ASCII into standard ASCII.

There are two printing features which are real bonuses. At the end of the text you can type " 'up arrow'nt=(name)," and after it has finished printing the current text it will automatically load the text with the file name given. That means printing texts which require more than one file to save them becomes more or less automatic. There is a hidden benefit in this command. The second text file does not have to include all of the formatting commands. The program remembers the instructions given in the first file, and continues to use them for the second file.

The second bonus feature is for people who use form letters. While the program is printing one file, it can be instructed to stop and add something from a second file. Thus names and addresses can be added from a second file and even paragraphs can be inserted. For small businesses this will make form letters very easy to construct and produce.

In all there are 60 commands in this program, too many to review. But there are a few additional nifty features which should be noted.

If you would like to convert a professional model PET into a "normal" typewriter model, give the correct instruction and the program will redefine the keyboard.

Perhaps you do not want to redefine the whole keyboard; you would like to redefine only a few keys. If you know the ASCII value for the characters it is a very simple matter to redefine any key.

The program handles hyphenation in a very nice (and economical) manner. You insert a format command which says you do not want more than some number of spaces between the end of the printed line and the right margin. When the program is printing and comes to a line in which splitting a word would be necessary to carry out the instruction it prints the end of the line on the screen. Then the operator decides where to hyphenate or not to hyphenate at all. Hyphenation from a dictionary would be impossible on a small machine like the PET, but this is a pretty good substitute.

A Few Negatives

Okay, what are the bad features? One is that you are limited to 100 lines of text in a given file on the 16K machines. And that is 100 lines of 37 characters for the 2001 series. The program is 8.4K before initializing anything so that does not leave much room for text with a 16K machine. For all the nifty features you have to pay a price in shuttling text back and forth to tape or disk.

It takes a good deal of learning to use this program. There are lots and lots of options, and it takes a while to learn all of them and how to use them effectively. I have found it somewhat difficult to adjust the automatic page size and the header and page number neatly. But the finished product is worth the effort.

The instructions that come with the program are rather terse; they packed the whole thing into 11 pages. Careful reading and practice is required, but everything seems to be explained adequately (if not at great length). With the instructions comes a list of all variables and their functions. The manufacturer has tried to make it easy for individuals predisposed toward fiddling with the program to do just that. And on the back page of the instructions is the full list commands. The cover is clear plastic—mine is yellow. So there is not even any glare.

This is a very good program. And the real clincher is it costs $29.95 on tape or $32.95 on disk. It must be the buy of the year. □

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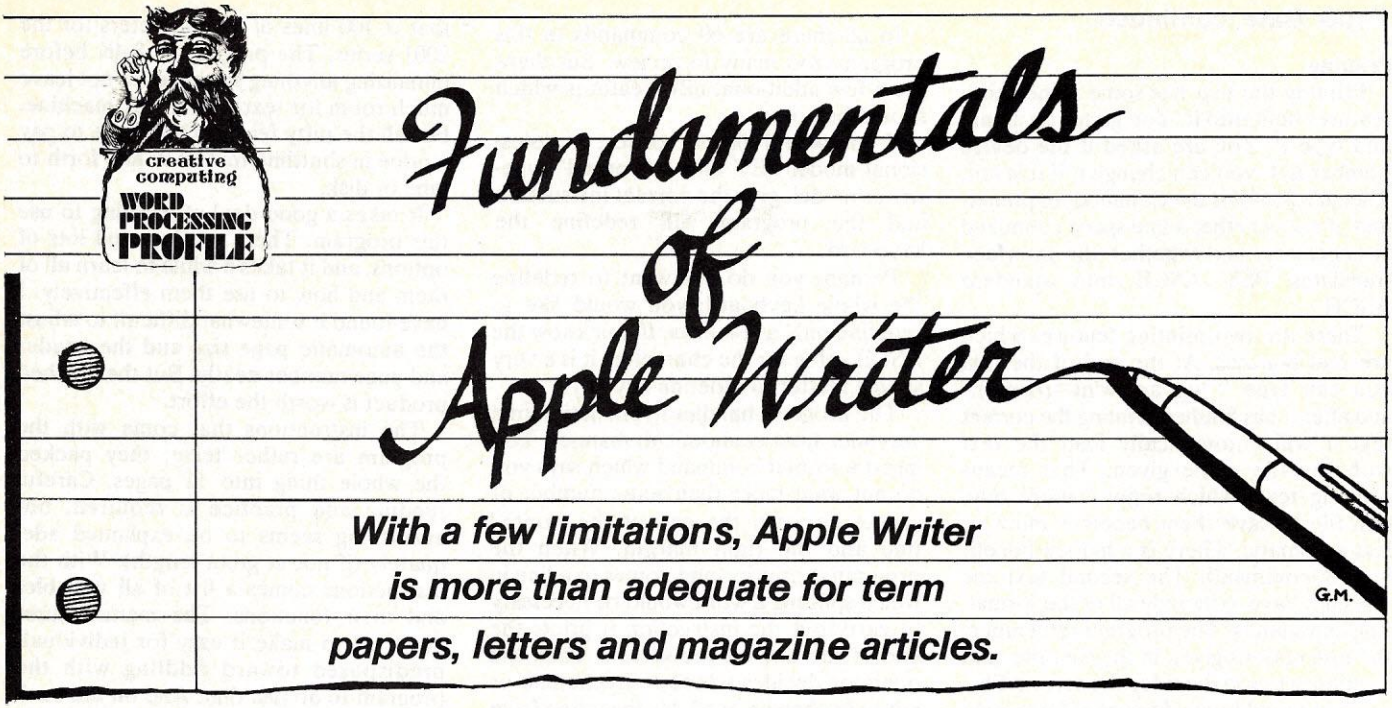
CIRCLE 181 ON READER SERVICE CARD

Fundamentals of Apple Writer



Apple Writer is an important program, and it's surprising how much can be said about it. Here are reviews from three different points of view.

Barry D. Bayer

First there were cave drawings. And then there was hand carved type. And finally, in 1456, Johann Gutenberg launched development of the technology of moveable type, making the ability to read a perfectly printed page available to the masses.

First there was paper punched tape. And then there were the IBM magnetic tape and magnetic card 'word processors' (the MTST and MTSC). And then, in the last couple of years, the Wang, Xerox, Qyx, Redactron, and all of the other computer technology word-processing systems, which are gradually bringing us into a new era, making the ability to type a perfectly printed page available to the masses.

And indeed the modern "word processor" is one of the hottest items of office technology making the rounds today. But most of the modern word processors are nothing but computers, with software appropriate to the easy manipulation of strings. Given appropriate software the microprocessor can do anything that the big machines can, and considerably cheaper.

There have been numerous articles published about microprocessor WP software, particularly the Electric Pencil, which has been made available for a variety of machine configurations, and sells in the $150 to $300 price range. Unfortunately, the Schrayer organization has not seen fit to make the Pencil available to 6502 owners, in general, nor to Apple users, in particular. Fortunately, a variety of software has been developed by Muse, Software Unlimited, and others to solve this vacuum. One interesting package is a program published by Apple Computer, Inc., and known, appropriately enough, as the Apple Writer.

Apple Writer comes with several machine language programs duplicated on two 5¼ inch mini-floppy disks, one a write protected systems disk, and the other designed as a working copy. Instructions are given to treat the write-protected disk with great care, as it is intended to be copied when the working disk is worn. (All of the Apple Writer programs are user transferable from disk to disk, and the company even tells us how to do it. It is nice to see a software publisher who trusts us.)

Booting the system with the working disk presents a menu which permits the operator to EDIT a file already in the computer, INITIALIZE a new file, PRINT the file in memory, SAVE the current file to disk, LOAD a file from disk to memory, or QUIT the system and return to Basic. (The actual commands used are, appropriately enough, "E," "N," "P," "S," "L," and "Q.")

Most people will probably take a quick run through the 7-page manual, and LOAD a "Tutorial" file into memory. Working through the Tutorial program gives one experience in manipulating the cursor to edit text in memory.

The initial Text mode is used to input lowercase text. Pressing the escape key once changes the cursor to an inverse video "^", indicating that the next character typed will be printed in uppercase. (This Upper Case mode effects only the next character typed; a second character will print in lowercase.) As the Apple does not support on-screen lower case, the Apple Writer convention is that all characters appearing upper case on the 40-column screen will print lower case (on a printer that has lower case, of course) and all characters to be printed in upper case are shown on the screen in inverse video. The use of the escape key instead of the shift key, as well as the inverse video, takes some getting used to, but should be no problem to the hobbyist.

Text wraps completely around the screen, going from column 40 on one line, and continuing on column 1 of the next, without requiring a carriage return. This results in strange-looking word breaks on screen, but makes no difference when the text is finally printed.

Pressing the escape key twice in succession changes the cursor to a flashing "+", and, taking a cue from the Apple II Plus, enables the operator to move the cursor about the text using the I,J,K and M keys (they form a diamond on your typewriter keyboard) to move one line up, one space to the left, one space to the right, and one line down, respectively. This Cursor Control mode is used to get to the exact position in the text where you wish to Insert, Delete, or whatever.

The repeat key makes the cursor move faster. Control V (Vertical) to go down about 12 lines, and a control T (Top) to go up about 12 lines make big jumps

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possible. (The Apple Writer is big on mnemonics. Control B to the BEGINNING, Control E to the END, Control I to INSERT, Control K to KEEP (save) a portion of the file to disk, Control S to SEARCH, and the like. This sounds a bit silly, but it makes the system relatively easy to learn.) Finally, putting the cursor into Cursor Control mode, and a Control Q, will QUIT the Edit routine, and return the program to the main menu.

The Control S search-and-replace feature, although nothing new to computers or word processing, deserves a couple of sentences of its own. When properly instructed, the Apple II will search from the current cursor position to the end of the file for a given string set off by delimiters of your own choosing. Continually pressing Return will get you to each such string found, one at a time. If you have given Apple Writer a replacement string, you can manually order a replacement, one at a time, or can demand the computer replace each instance of the searched for string with the replacement string. Fantastic for semiautomated form letters, and for those of us who always spell a common word the same wrong way, or for changing "Lessee" to "Tenant" all the way through a form lease.

Loading or saving a file involves nothing but typing an "L" or "S", a file name, and pressing Return. To delete a file, or to determine which files are on disk, one types a Control D, which takes you temporarily out of the program, and enables you to access DOS commands, directly. The print option causes another program named "printer" to BRUN, and presents the user with a menu having options of PRINTING a new document, CONTINUING the printing of a document already started, LOADING a file from disk for printing, RETURNing to the Editor, or QUITing the system. ("P," "C," "L," "R" or "Q," of course.)

The new-document option produces yet another menu which permits change of print parameters such as left, right, top and bottom margins, lines per page, spaces between lines, and location of printer-driver routine. The parameters are stored on disk, and will be available, in exactly the altered form, when the new document option is chosen again. The parameter menu then yields to a small menu which gives the user the choice of printing, or pressing escape, which will return to the Print menu for another try. If one chooses Print, the printing will start immediately, unless one has chosen the Single Sheet parameter, in which case the program will stop and allow the user to check paper one last time.

Apple Writer comes nicely packaged, with adequate documentation And it works.

Apple Writer gives the user the additional formatting option of embedding format commands into the text. Each such command must be preceded by a carriage return and a "[". As these commands are part of the text (although, of course, not printed) they may be rather conveniently changed by the Search and Replace routines. These commands take precedence over the values presented in the parameter menu.

Depending on which imbedded commands have been inserted into the text while inputted, and also depending on default values entered in the parameter menu, printing can be justified left, right, centered, or full (simultaneously right and left); spacing can be single, double or more; margins can be varied, and pages numbered and titled. The operator has nothing to do but watch the printer (and feed paper if using single sheet operation.)

Apple Writer, as with all Apple-produced software that I have seen, comes nicely packaged, with adequate documentation. And it works. I suspect that a secretary in a business office might be reluctant to use it, as the inverse video can be confusing to the uninitiated, and one cannot see the typed format on the screen because of the Apple's 40 column display. Each of these are limitations of the computer, however, and not of the software. (There are a number of hardware modifications which provide lowercase characters, and even 80 column lines. The serious user may want to adapt the machine to make it look like a typewriter.)

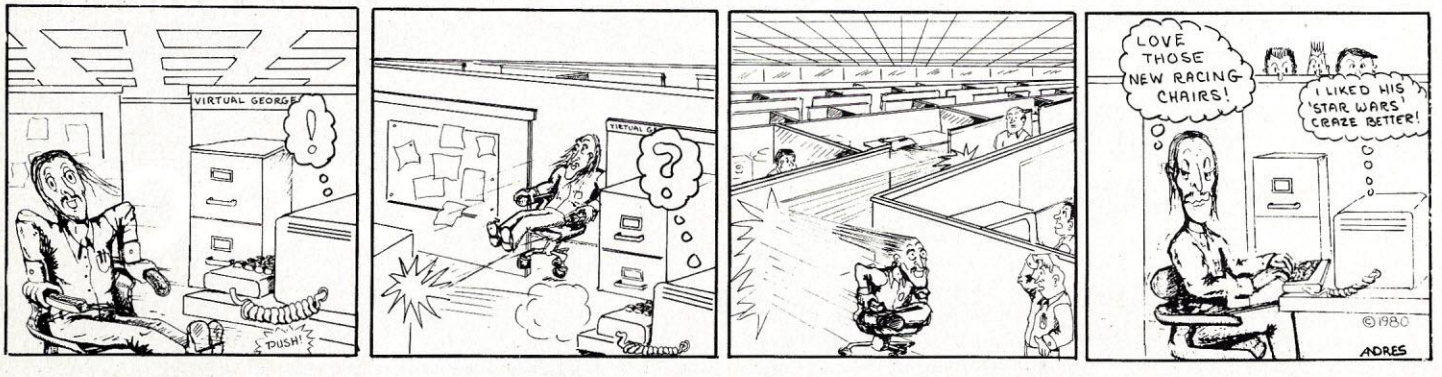
But for someone who is willing to accept these limitations, the system is more than adequate for light typing such as term papers, complaining letters to software manufacturers, and magazine articles.

Although form letters are not provided for, as such, use of the search-and-replace routines as well as the block-insert and move commands make semi-automated form letters possible.

One disturbing feature of the entire package is the very careful DISCLAIMER OF ALL WARRANTIES AND LIABILITY emblazoned on the Copyright page of the manual. I believe that it is completely irresponsible for a software publisher to attempt to disclaim ALL warranties for a product. At the very least, a purchaser should be able to get his purchase price returned if the product doesn't work as represented in some important respect. (I wish to make clear that the Apple Writer does work, and that Apple is not the only culprit in this regard.) I imagine that Apple would probably do this voluntarily if a disastrous bug was pointed out, but any purchaser should read (and demand to see) any warranty information on any significant purchase, prior to paying, or at least have some sort of understanding with the retailer prior to purchase.

At $75 list price, the Apple Writer isn't fancy. It doesn't have a number of features such as automatic paragraph indentation, multi-file search, underscoring, and on-screen totals. But it will certainly make your written communication much clearer and easier. □

Popular Computing — Chas Andres



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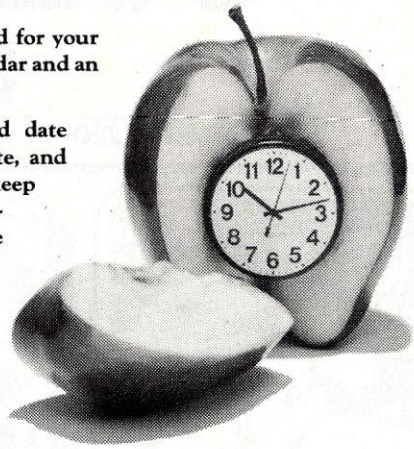

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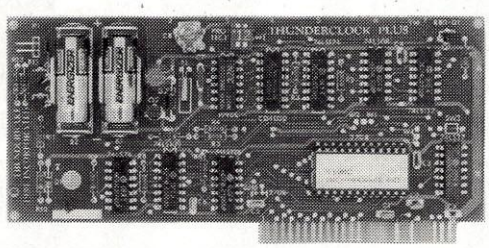

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Through the Magic Window

Al Evans

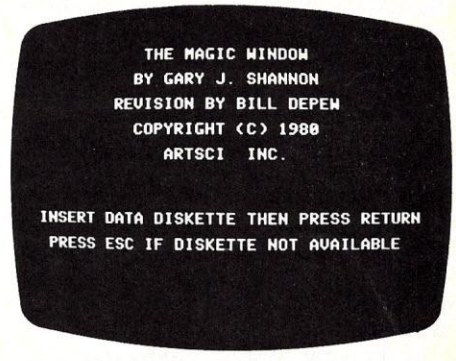
creative computing
SOFTWARE PROFILE

Name: Magic Window
Type: Word Processor
System: 48K Apple, Disk
Format: Disk
Language: Machine Language
Summary: Very easy to use
Price: $100
Manufacturer:
Artsci, Inc.
10432 Burbank Blvd.
N. Hollywood, CA 91601

From the simplest to the most sophisticated, any word processing system is basically just an electronic device for making marks on paper. One measurement of the ease of using a word processor is its "transparency"—the similarity between what appears on the screen and what is printed as final copy. From this standpoint, Magic Window, written by Gary Shannon with revision and documentation by Bill Depew, may be the best word processing system available for the standard 40-column Apple II computer.

The "virtuality" (to borrow a term from Ted Nelson) of Magic Window places you behind a window looking at a seemingly gigantic sheet of paper—say 24" by 36". You are at the keyboard of an enormously powerful typewriter, with the ability to deposit any ASCII character anywhere on this sheet in proportionately huge letters. You control the operation through the keys on the keyboard (most of them usable in two different ways), a main control menu, and subsidiary menus used for job formatting, filing, printing, and system configuration.

The Magic Window master disk boots in a single step on any Apple II system—13- or 16-sector. If a language card or compatible RAM card is installed in slot #0, the program will load there, giving the user about 10K of extra text memory. When loading is complete, Magic Window allows you to insert a text disk for automatic system configuration then displays a Subsystem Menu.


THE MAGIC WINDOW
BY GARY J. SHANNON
REVISION BY BILL DEPEW
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INSERT DATA DISKETTE THEN PRESS RETURN
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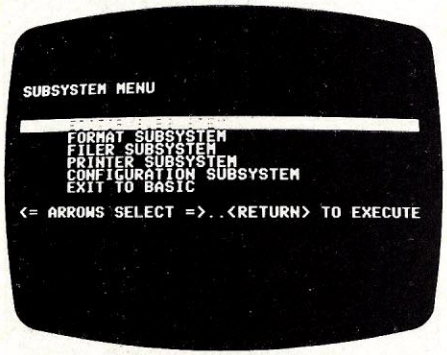


Magic Window menus are paragons of simplicity: use the arrow keys to move a white bar over the function you want, press Return to execute that function. The Subsystem Menu offers six choices: Editor Subsystem, Format Subsystem, Filer Subsystem, Printer Subsystem, Configuration Subsystem, and Exit to Basic.

The Configuration Subsystem customizes Magic Window for your computer and printer. The system will use a lower-case adapter if you have one (otherwise, capital letters are displayed in inverse characters). You can choose Upper Case Only for editing text files created from Basic programs, etc, or you can select Keypressed Sound for a "tick" each time a key is pressed (this helps establish the "typewriter" illusion).

After your system configuration is defined, it can be stored in a special file on each text disk. It can then be loaded semi-automatically during the startup process as mentioned above.

Using the Program

Now we're ready to follow a typical job through Magic Window, from formatting to printout.

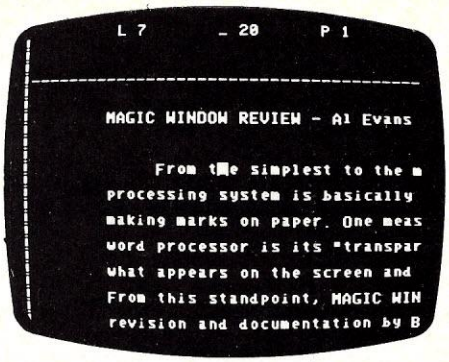
The first step is to select the Format Subsysytem from the Subsystem Menu. This subsystem is used to define the "sheet of paper" you will be using: number of lines, number of characters per line, left and right margins, top and bottom margins, single or double spacing. After a format has been defined it is normally stored on the disk with the text that uses it.

The "sheet of paper" you define can be from one to 84 lines long and from 20 to 85 columns wide. This sheet can hold from one to 84 lines of text, each containing 20 to 80 characters.

After the format is set, Magic Window is ready to accept input. Select the Editor Subsystem from the Subsystem Menu and press Return. You will see one line of data showing the present cursor position on the page (line number and space number) and the number of the present page (relative to the first page of the current text). If you have entered no text, the rest of the screen is blank except for the dashes representing the edges of the "paper" and a blinking underline cursor in the center.

Overall, the text editing facilities of Magic Window are comprehensive, well-designed, and very easy to use.

One unusual feature of Magic Window is that the cursor never moves; it stays right in the middle of the screen. Instead, the "paper" moves under it, just as it does on most typewriters. Any portion of the "sheet" (within the margins you have set) can be moved under the cursor. The cursor is non-destructive; it can be moved over existing text without erasing it.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MAGIC WINDOW REVIEW - Al Evans
From the simplest to the m
processing system is basically
making marks on paper. One meas
word processor is its "transpar
what appears on the screen and
From this standpoint, MAGIC WIN
revision and documentation by B

Text entry is similar to other word processing systems. A carriage return is required only at the end of a paragraph. If you make a mistake, just backspace and type over it. Tabs can be set and cleared as on a typewriter, with one very handy difference—you can tab either forward or backward.

Editing can be performed any time during or after text entry. The editing commands are all control functions. For example, control-S is "tab right" and control-A is "tab left." The functions are assigned to the keys in logical patterns, rather than mnemonically. For example, control-Q is "up one line," control-W is "up half a screen," and control-E is "top of file." Similarly, control-Z is "down one line," control-X is "down half a screen," and control-C is "bottom of file." A large color chart showing all the editing commands is included with the Magic Window package (Figure 1).

Magic Window uses the so-called "split and glue" approach to editing. The "split" command (control-T) is used to isolate portions of text for alteration or deletion and to open up space for insertions of any length. The "glue" command (control-G)

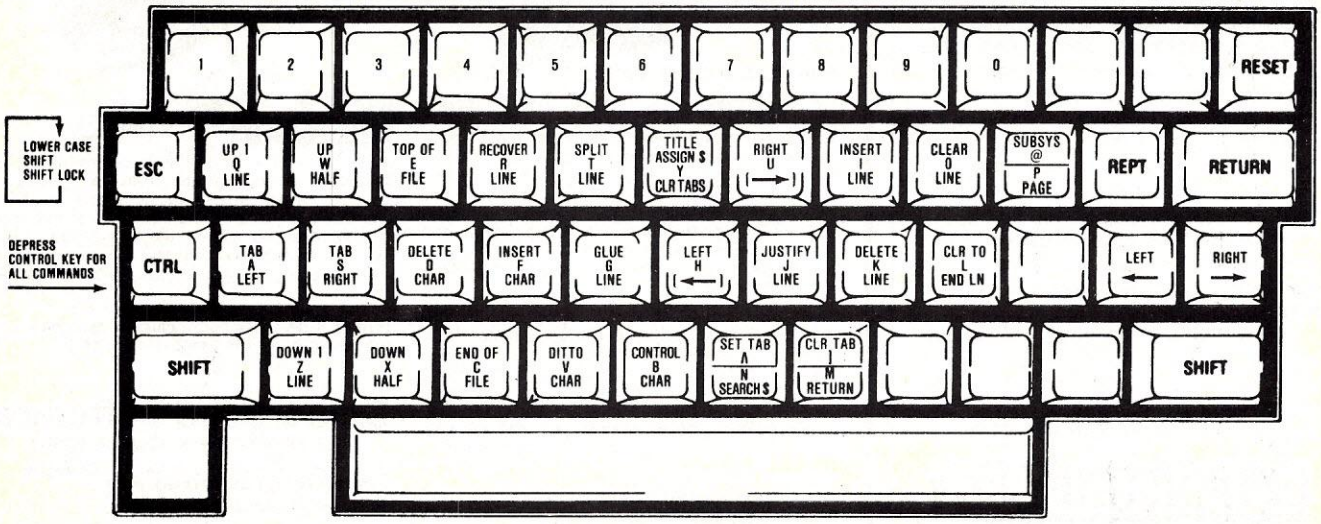

Figure 1. Magic Window editing commands. A large colored chart of these commands is supplied with the system.

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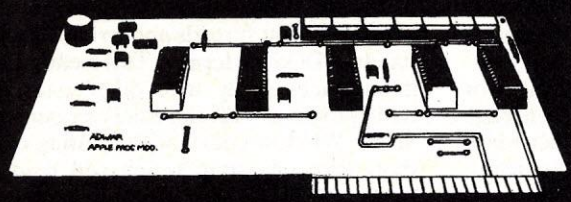

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word processing system

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The most impressive feature of the WINDOW is the way it emulates a standard typewriter. You actually can see the edges of the paper you are typing on. This feature lets you position your text on the paper when you type it. You don't need to review your text and insert formatting commands.

You have probably purchased one or more of the peripheral products available for you Apple (language system, lower case adapter, printer, etc.) The MAGIC WINDOW will automatically use these new products if you have them. MAGIC WINDOW will boot on 3.2 or 3.3 DOS systems. And if you have a language system it will use the extra memory.

MAGIC WINDOW uses two types of disk storage, binary files and text files. The text file gives you the ability to load and save files that can be used by other programs. Binary files are used to store your documents, page size and tab stops quickly and completely.

With the MAGIC WINDOW you may never need to hit return. When your text touches the right margin the last word will automatically be picked up and placed on the next line allowing you to continue typing. When you reach the bottom of the page the WINDOW will jump to the top of the next page without causing any interruptions. The search function will help you find any occurrance of a word for correction or deletion.

Text storage, printing, and system configuration are controlled by a unique menu structure. This avoids complicated command sequences. Function selection is simple and syntax free.

Centering and justification is simplified by your being able to see text on the screen. There is no need to print out a work copy of your text.

Unlike other systems that separate the tasks of editing text and formatting for printing, MAGIC WINDOW shows you the exact placement of your text as you type it.

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is then used to piece the text back together.

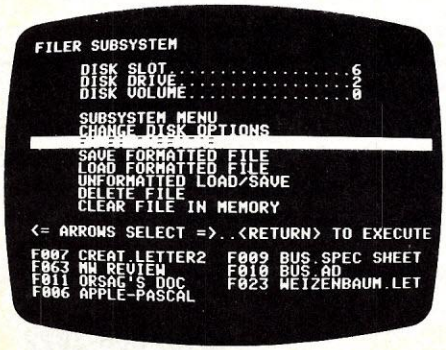
In addition to these functions, the Editor Subsystem has commands for inserting and deleting characters, deleting and recovering lines, copying characters from the line above, clearing the present line, and clearing from the cursor to the end of the present line. There are also commands for setting and clearing tabs, inserting blank lines, and returning to the Subsystem Menu.

Control-B allows you to insert a literal control character into the text. Control-J permits justification (flush left, flush right, flush left and right, center). Each line is adjusted individually, so that you can correct "loose lines" by hyphenating words, etc. In fact, one of the best features of Magic Window is that you can always see where the lines, paragraphs, and pages will end in your file copy.

Finally, the Editor Subsystem has a "miscellaneous" command: Control-Y, which brings up a menu which allows you to clear all tabs, assign a search string for global search, assign a title line (such as a section heading and location for a page number), and switch between two sets of characters not normally available which are assigned to shift-N, shift-M, and the "/" key. These characters include the circumflex, the tilde, the underline, the right and left curly brackets, the right and left square brackets, and the backslash.

Overall, the text editing facilities of Magic Window are comprehensive, well-designed, and very easy to use. Those familiar with other word processors will note the absence of "block move" and "global replace" functions. The system has a "global search," but the "replace" is manual. "Block moves" are accomplished by deleting groups of lines from one place in the text and recovering them in another. There is also a slightly more complicated technique which uses "unformatted" (sequential text) disk files.

When text entry is complete (or, if you're the cautious type and have entered more than you want to lose to sudden power failure), return to the Subsystem Menu and select the Filer Subsystem. This subsystem allows you to load and save two types of disk files (formatted and unformatted), to delete files, look at the directory for the current disk, change drive and slot numbers, and clear the memory for new text.



The final step in creating a document with any word processing system is printing. The Printer Subsystem, which is selected from the Subsystem Menu, permits you to print all or any part of your file on either paper or disk.

You can select upper-case-only for printout, specify a stop after each page (for sheet-fed printers), and select Mark Perforation for printing on roll paper which is later to be cut into sheets. This is also where you set the starting page number (page numbers must be in the 0-255 range).

After all the parameters are set, select Print Hardcopy. The system gives you an opportunity to set your paper to the "top-of-form" position. Since you already know what the final copy will look like, the rest is automatic.

The program will load into the Apple language card if you have one, providing more text memory.

Special Features

So what does Magic Window have that other competitive systems (i.e. systems priced under $300) don't have?

In my opinion, the most important feature of this system is that it acts like a typewriter. What you see on the screen is what is finally printed on paper; there are no arcane-looking inverse chracters, lines of numbers separated by commas, flashing brackets, etc. If I were going to train somebody completely ignorant of computer systems to use an Apple word processor, this is the one I would choose. The actions taken are always visible, and operation rapidly becomes second nature.

The "typewriter" illusion is broken only by the use of the Escape key for shifting between lower case and capitals. There are systems in which the shift keys are wired to perform their normal typewriter functions. Unfortunately, this has some drawbacks. First, fewer characters can be accessed from the Apple keyboard if the shift keys are used for upper-lower case shifting. Second, many other systems I often use (for example, the Pascal 1.0 editor with the Paymar lower-case adapter and Bill Blue's ASCII Express) use the Escape key for upper-lower case control, and *any* degree of standardization is welcome. Finally, there is one definite advantage to using the Excape key: lines of mixed caps and numbers can be typed without unshifting for the numbers.

Another major advantage of Magic Window is that it reads and writes files in standard DOS 3.2 format. This means that it interfaces easily with other systems, Basic program, Visicalc, etc. For example, Magic Window comes with a listing of a short Basic program which will read a "softcopy" disk file and send it to a printer. This program can easily be modified to merge two files, for example one containing text and one containing addresses, in order to create customized form letters, etc. Magic Window "softcopy" files can also be uploaded to or downloaded from other computers using standard terminal programs.

The system has several minor, but useful, special features. As mentioned above, the program will load into the Apple language card if you have one, providing more text memory. Printer and interface commands are entered directly into the text as literal control characters, making it easy to use all of your printer's capabilities. In addition, the spaces "between the lines" are manually accessible in the double-spaced format, so that you can "fake" superscripts by placing them between two lines of text. Finally, Magic Window is a turnkey system which will boot in a single step on any Apple I, regardless of configuration.

Shortcomings

So, is this a perfect system? Well, not quite.

For one thing, the disk is "copy-protected." Protecting a disk against copying is inherently a theoretical absurdity. It doesn't hinder the knowledgeable, and causes problems for the inexperienced user, who is most likely to do the wrong thing at the wrong time and wipe out a disk.

However, I should mention that the Magic Window disk is used only once—to load the system. It is never accessed or written to during normal operation, and should therefore be safe unless exposed to stray magnetic fields, excessive heat, etc.

Line length is limited to 80 characters, which could make the system unusable in some applications. There is no way of checking how much memory is availble, but this is no problem after you learn how many pages your system will hold. Finally, there is no automatic way to change formats in the middle of a page, for example to insert a single-spaced quotation in block format within a double-spaced paper. However, this is easily accomplished by means of tab stops and manual linefeeds.

Conclusion

When I retired my typewriter, I bought a printer, a lower-case adapter, and a copy of a well-known word processing system for the Apple. The printer and lower-case adapter worked fine. The word-processing system would work for several hours, then wander off into never-never land, leaving pages of text still stored in memory. Although I could find the text in memory and BSAVE it, this system used a non-standard DOS (another "copy-protect" feature), and there was no way to get the text back to the word processor. A week later, I gave up and went shopping. After extensive comparison I bought Magic Window.

Am I satisfied? Well, I've had Magic Window for about four months. In that time I've used it in translating about 400,000 words of French and Italian scientific material and in writing three magazine articles. My income depends primarily on these words, and Magic Window has never lost one of them. Every part of the system always does precisely what the instructions say it will do. Operation is so easy and predictable that my typing speed has increased 40%.

In this time, I have also tested several more expensive microcomputer-oriented word processing systems and one "dedicated" word processor. For my purposes, Magic Window compares favorably with the best of them.

I highly recommend Magic Window for any type of document preparation and general sequential textfile handling which requires no more than 80 columns of text.

In brief, Magic Window is a well-designed, well-documented, versatile, and very dependable system. □

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A Review of Spellguard

Computer-Assisted Proofreading

Sanford I. Gossman

creative computing
SOFTWARE PROFILE

Name: Spellguard
Type: Proofreading Utility
System: CP/M, CDOS, Dual Disk Drives
Format: Disk
Language: Machine Language
Summary: Checks for misspelled words
Price: $295
Manufacturer:
Innovative Software Applications
Box 2797
Menlo Park, CA 94025

I am a free-lance technical writer. I spend a lot of time looking for spelling and typing errors in what is otherwise finished text. It is primarily wasted time, and certainly not profitable. I recently heard about the "dictionary programs" that were becoming available to provide just the kind of help I need. Spellguard is one of them.

Spellguard proofreads text files created with a text-editor or word processing program. It compares each word to the entries in a dictionary. Thus, it can detect words that are misspelled or otherwise incorrectly typed.

Spellguard is easy to use. It is entirely menu-driven and, therefore, can be quickly put to use without first spending a substantial amount of time with the documentation. I had it working in about ten minutes. The program logic flows naturally, and the displays and prompts are well "humanized." The input scheme is carefully designed so that each operator input produces an immediate program response. Thus, an operator error is immediately detected and an appropriate error message is displayed.

Sanford I. Gossman, 35 Eucalyptus Lane, San Rafael, CA 94901.

It can detect words that are misspelled or otherwise incorrectly typed.

There are five basic steps to using the program:

1. Text is processed through a dictionary;
2. Words that aren't in the dictionary are displayed;
3. The disposition of each mismatched word is determined;
4. Every occurence of each mismatched word—which was flagged for marking—is marked in the text;
5. Errors (typo/spelling) are corrected using the editor.

The file to be proofread is indicated either in the command line invoking the program, or by answering a prompt after the program is loaded. A disk can be displayed from within Spellguard by entering a letter, followed by a colon, instead of a file name. The directory is presented in alphabetical order and the names of filetypes not used by Spellguard (such as .COM and .BAK) are not displayed.

After proofreading, the program enters the "word review" phase: words that aren't in the dictionary are displayed, one at a time. To each displayed word, you respond in one of three ways:

A: if the word is spelled correctly and you want it Added to the dictionary;

M: if the word is spelled incorrectly and you want all occurrences of it Marked in the text;

I: if you want the word Ignored (used if a word is spelled correctly but, because of infrequent use, or another reason, you don't want it included in the dictionary.

The words are displayed in upper-case and in alphabetical order. The alphabetical listing makes referring to a "paper dictionary—to check spelling before adding a word—very easy, because you don't have to skip around. In addition, each word is preceded by a number indicating how many words there are left to review.

The text is then processed again. Every occurrence of the mismatched words that were specified as improperly spelled are marked by overwriting the last character of the word. (The marking symbol is a "[" as delivered, but can be easily changed to whatever character you want. The original copy is normally retained as back-up, with a .BAK extent; this function can also be easily changed.)

Finally, the "find" function of your text-editor is used to locate and display each occurrence of the Spellguard marking character. You correct the errors in the usual way, and eliminate the marking character.

Hyphenated words are handled very effectively. When a hyphen appears anywhere on a line except as the last character, the hyphenated word is presented in the usual way, with the hyphen treated as a character. If you indicate that you want the word to be added to the dictionary, it will be saved with the hyphen, thereby creating a hyphenated word entry: like open-ended, topsy-turvy, or day-to-day.

However, when the hyphen is the last character of a line, the word is displayed—again with the hyphen—but with a message noting that the hyphen was the last character of a line, and instructions to evaluate the word by "pretending" that the hyphen is placed in the text as displayed.

The most impressive feature of Spellguard is speed.

In other words, that the word would be hyphenated even if it wasn't split between two lines.

Based upon your response, Spellguard may display the word again—with the hyphen removed—depending upon a rather complex set of program rules.

Clearly, the most impressive feature of Spellguard is speed. The manufacturer claims that 10,000 words of text can be processed through a 20,000 word dictionary in one minute. However, using my system, I wasn't able to duplicate the time. I clocked the processing time of a 20-page document **at just under a minute and a half. The difference is apparently caused by the characteristics of disk operations of my system. On another system, I have seen the product exceed the claims.**

Therefore, I am getting effectively the same read/write speed as if I was using a single-density format. However, even this slower speed should be fast enough for anyone.

Spellguard comes with a dictionary of 20,000 common words. It provides a good foundation, and through normal use, is easily expanded to include other words required by the user: "jargon," names of clients, names of cities, etc.

The documentation is logical, well-written, easy-to-read, and contains an abundance of screen images. These clearly show the user what to expect when using each function. There are some topics, though, that would benefit from a clearer explanation.

Since WordStar allows access to .COM files, I access Spellguard from within WordStar. I merely type "R SP filename" while at the "no-file" menu. After the text has been processed and the mismatched words marked, I re-enter WordStar and correct the errors. Using this technique, it's very much like having Spellguard as a WordStar function. The combination is a pleasure to use.

ISA has a rather unique sales policy: Spellguard is sold with a 30-day, money-back, trial acceptance guarantee. If the program does not perform on your equipment as ISA claims, they will give you a prompt refund. Forms for refunds, replacement of lost or damaged distribution disks, and making bug reports and suggestions are included. ISA pays for bug reports and worthy suggestions.

Spellguard works. I can't think of another program that is so beneficial, and that operates fully, without the user having special knowledge or having to spend many frustrating hours reading a manual before the first use. □

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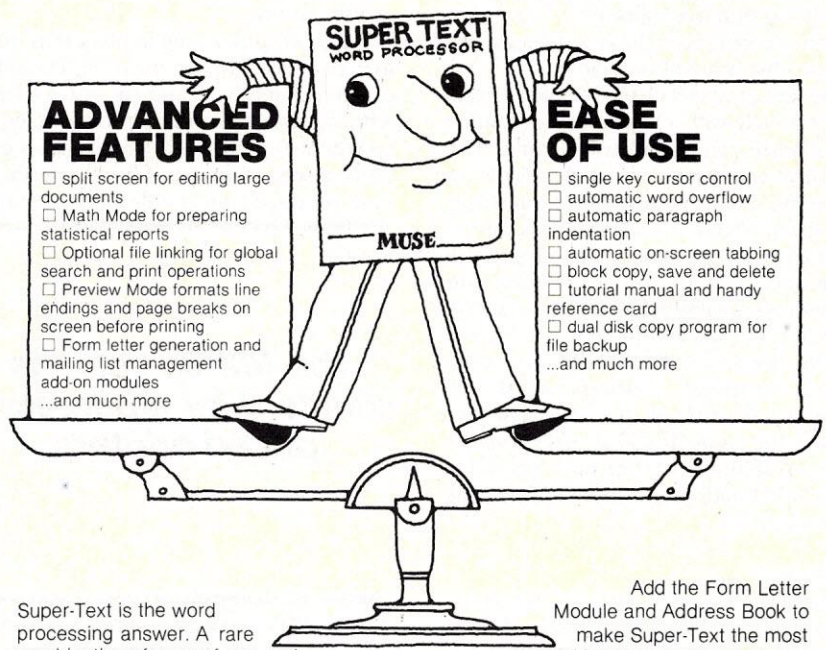

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Epson MX-80

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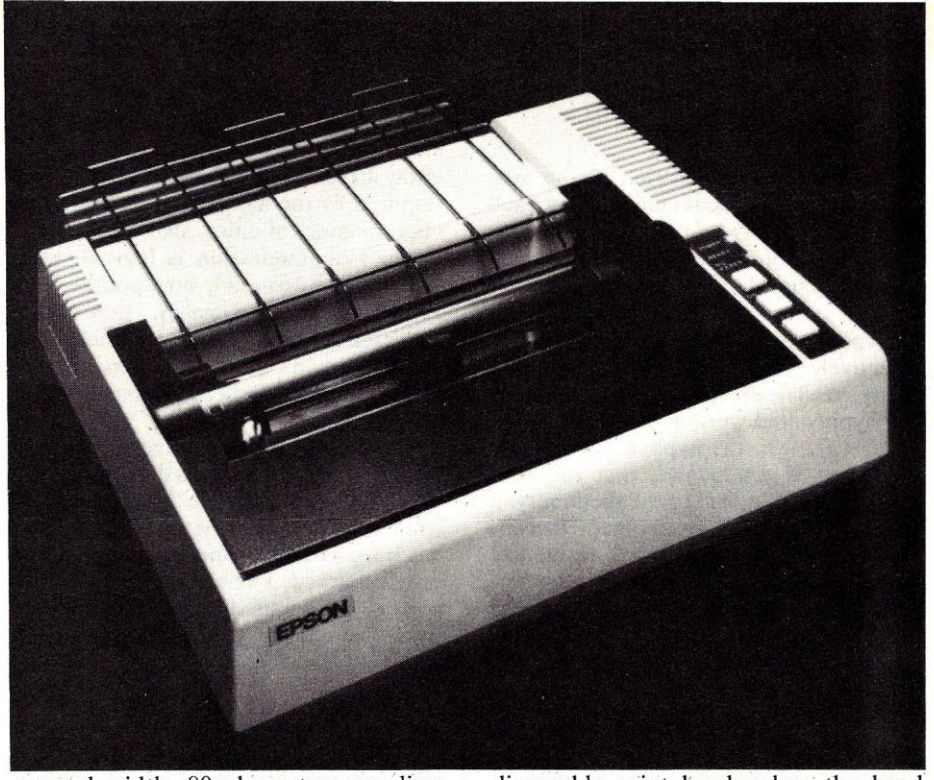

Some dramatic developments have occurred recently in the market for printers priced under $1000. Features such as correspondence-quality print, graphics and high throughput have appeared. The Epson MX-80 incorporates these advances and carries a list price of only $645.

The unit prints 80 characters per second bidirectionally with a logic-seeking function to minimize print head travel time. The tractor mechanism is adjustable for 4" to 10" forms. The 9 x 9 dot matrix produces very sharp letters with descenders for the lower case g, j, p, q and y. By using multi-strike and/or multi-pass techniques, correspondence quality print can be produced. In addition to the complete set of TRS-80 graphic characters, special characters for French, Japanese, German and British usage can be printed. An add-on kit for use with the Apple II will provide graphics with a resolution of 120 dots per inch. (This kit should be available by the time you read this.)

Interfacing

The MX-80 comes with a Centronics-compatible parallel interface. Epson produces an interface board and cable for the Apple II and a cable for the TRS-80. I would recommend using the Epson interfaces. The firmware on Apple's own Centronics parallel board always sets the 8th data bit high. This bit is used by the MX-80 for TRS-80 graphics characters. The 8th data bit would have to be grounded on the Apple board for use with the Epson. The standard TRS-80 cable can be used, but some special features will not be available.

Character Fonts

The MX-80 has four sizes of print which are software selectable. The options are: normal width, 80 characters per line; normal width/compressed, 132 characters per line; double width, 40 characters per line; double width/compressed, 66 characters per line.

For word processing applications, there are two additional print modes. The enhanced mode, which is not available with compressed print, produces correspondence-quality print by striking each letter a second time to fill in between the dots produced on the first strike. In the double strike mode, the paper is advanced 1/216th of an inch and the line is printed again. The double strike mode can be used with all print densities and even along with the enhanced mode. Both modes reduce speed by 50 percent.

The MX-80 sets the standard for moderately priced printers.

To change print size, engage the special print modes or other paper-handling chores, all that is required is to issue a command in the form of "print chr$(14)" or "print chr$(27)+'e'" to the printer.

Other Features

The unit comes with such paper-handling features as horizontal and vertical tabs, form feed, line spacing of 1/8, 7/72 and 1/6 of an inch. An out-of-paper buzzer and a self-test mode are also included. A unique feature of the MX-80 is its disposable print head; when the head reaches its rated life of 50-100 million characters, it can be replaced by the user with a new one which costs less than $30.

Documentation

The User's Manual for the MX-80 was written by David A. Lien, the author of *TRS-80 Level I User's Manual*. It is written in the same light-hearted style as the TRS-80 manual. The manual, which is over 100 pages long, has sample programs and illustrations explaining all of the special features of the MX-80. Although the manual is written with the TRS-80 user in mind, it is equally informative for users of other computers. Separate appendices are included for users of Apple II, TRS-80 Model II, and TRS-80 Model I with the standard cable.

Noise

The unit is very quiet compared to other dot matrix printers. Friends, who own other brands of printers, have been very impressed with the low noise level of the Epson. At idle the unit makes virtually no noise.

Appearance

The Epson MX-80 is compact (14.7" x 12.0" x 4.2") and weighs only 12.1 lbs. The case is plastic and almost matches the color of my Apple II. The clear plastic top is hinged to allow access for easy paper loading, and the unit comes with a wire paper guide.

Drawbacks

With the outstanding print of the Epson, many users will want to use it for printing letters. However, the printer does not have any provison for feeding single sheets of paper. To use a sheet of letterhead, one must adjust the print head to its thickest paper setting (an easy chore), and then

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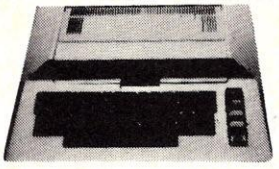

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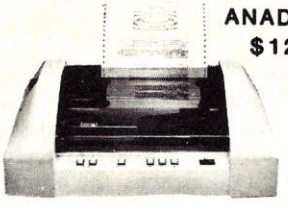

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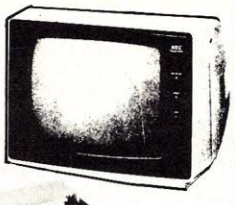

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CIRCLE 213 ON READER SERVICE CARD

FIGURE #1

```
NORMAL WIDTH (80 CHARACTERS PER LINE)
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghij
klmnopqrstuvwxyz{|}~

NORMAL WIDTH/COMPRESSED (132 CHARACTERS PER LINE)
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~

DOUBLE WIDTH (40 CHARACTERS PER LINE)

DOUBLE WIDTH/COMPRESSED (66 CHARACTERS PER LINE)

DOUBLE STRIKE PRINTING WILL PROVIDE A MORE DENSE PRINT

ENHANCED PRINT WILL GIVE A CORRESPONDENCE QUALITY PRINT

ENHANCED PRINT WITH DOUBLE STRIKE IS EVEN MORE DENSE
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghij
klmnopqrstuvwxyz{|}~
```

tape the letterhead to the tractor feed paper. This is not as difficult as it may sound, but it is an annoyance.

A friend mentioned that he has to be careful to avoid paper jams with his MX-80. I set-up my printer using the paper feeding pattern recommended in the User's Manual and I have not had any problems with the paper jamming or re-feeding.

There are two features that I wish had been included in the design of the printer.

1) A larger FIFO buffer. I use the printer for a hard copy of data I obtain on The Source telecomputing network. With the Epson's buffer capacity of only one line of data, a delay must be added to incoming data so the printer can keep up. This is not a problem, but it does slow things down, and connect time does cost $4.75 per hour.

2) Proportional spacing. This would be a nice feature for word processing applications.

Summary

The Epson MX-80 is an outstanding printer that has performed flawlessly during the three months I have had it. Except for some minor omissions, the printer has all the features a hobbyist or small business could want. With its outstanding print quality, low noise level and high quality construction, I think the MX-80 sets the standard for moderately priced printers. (Epson America Inc., 23844 Hawthorne Blvd., Torrance, CA 90505.) □

TRS-80 Graphics with the MX-80

The MX-80 has a built in character graphics set that is compatible with TRS-80 graphics. However, the graphics characters are displaced from normal TRS-80 graphics, ranging from CHR$(160) to CHR$(223) instead of from CHR$(128) to CHR$(191). The following program offers a screen print routine for the Radio Shack computer. The illustration is from Android Nim, published in the June 1981 issue of *Creative Computing*.

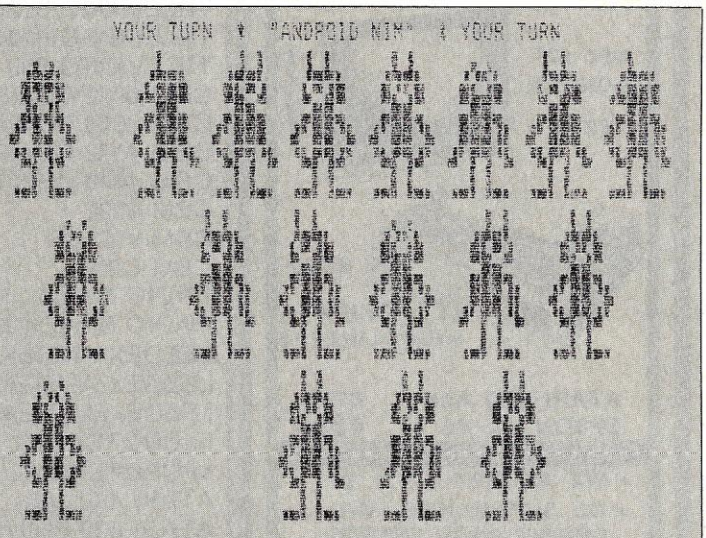
To use the print subroutine with a TRS-80 program, simply insert a subroutine call into the program at the point you desire a screen print. At *Creative Computing*, we saved the routine on diskette as an ASCII file with the command:

SAVE"SPRINT",A

and when we wish to use it in a program, we merge it with the command:

MERGE"SPRINT"

Then we insert **GOSUB 32000** at the appropriate location in the program.—*George Blank*




```
31999 REM ! EPSON MX-80 SCREEN PRINT SUB-ROUTINE ! G.BLANK !
32000 FOR DX=15360 TO 16383 STEP 64
32010  FOR DY=0 TO 63
32020   DZ=PEEK(DX+DY):IFDZ>127 AND DZ<192 THEN DZ=DZ+32
32030   LPRINT CHR$(DZ);
32040  NEXT DY
32050  LPRINT
32060 NEXT DX
32070 RETURN
```

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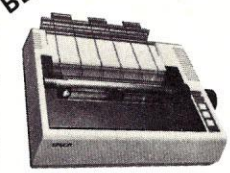

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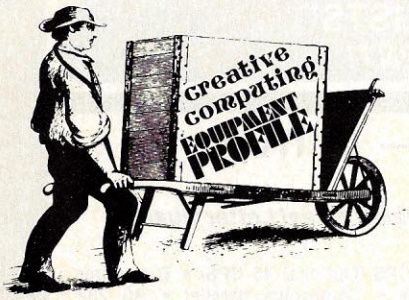


The Dynatyper Typewriter Interface

Jim Cavuoto

Of all the possible uses of computers, word processing probably has the most potential for luring new people into the growing family of computer owners. But there is one factor which may still inhibit many of these people: the cost of a letter-quality printer, which is likely to be two to four times the cost of the computer itself.

There is another, perhaps psychological, barrier preventing people—especially writers, or would-be writers—from investing in computer equipment for word processing. For these people, the typewriter has become the cornerstone, the articulator of their creative efforts, and to give it up in favor of a complicated, untested new system would certainly be a risky venture—not to mention a waste of the money they have already invested in a good electric typewriter.

Fortunately, there is a product that helps overcome both the financial and psychological resistance to using computers for word processing. It is the Dynatyper typewriter interface from Rochester Data Inc., a device which rests on the typewriter keyboard and accepts output supplied by the computer. For about one-fifth the cost of a letter-quality printer, it is possible to turn your typewriter into a component in your computer system. But how well does it work? I hope to show in this review that it works quite well.

Jim Cavuoto, 2004 Curtis Ave. #A, Redondo Beach, CA 90278.

My first reaction when I saw a picture of the Dynatyper sitting on top of a typewriter was to chuckle—"do they really expect me to believe this is going to work?" It does. I've been using it for several months with my Apple and IBM Selectric typewriter, with excellent results. It will work with any electric typewriter—I've even seen it power a portable Smith Corona that was almost smaller than the Dynatyper itself. The advertisements boast that the Dynatyper lifts on and off in five seconds, but this is wrong. It takes me three and a half seconds. This feature, plus the fact that no modification to your typewriter is required, is a major selling point to writers who want to preserve the sanctity of their typewriters.

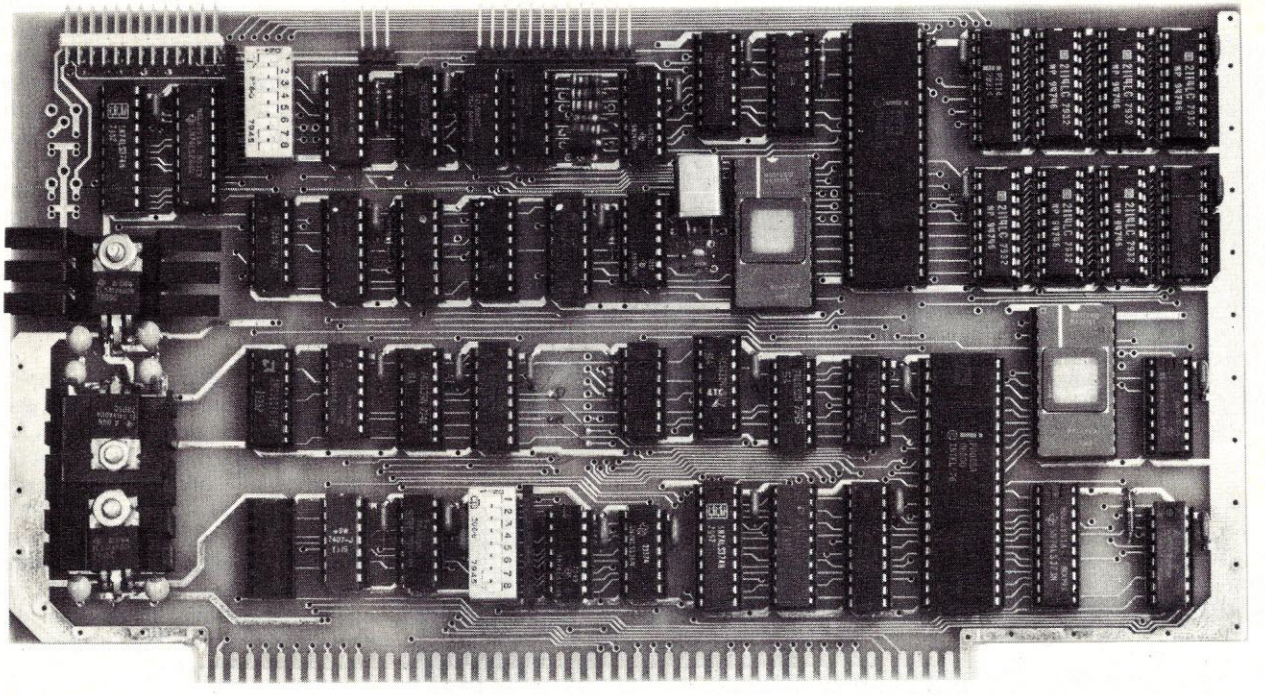
For about one-fifth the cost of a letter-quality printer, it is possible to turn your typewriter into a component in your computer system.

Theory of Operation

The Dynatyper consists of a lightweight case housing 52 "plungers," each of which rests in a solenoid. It is these plungers, which are half delryn and half metal, that physically strike the keys on the typewriter. A plunger is activated when current flows through its corresponding solenoid, setting up a magnetic field that thrusts the plunger downward and hits the key on the typewriter. It is this ingenious mechanism that gives the Dynatyper its excellent performance, pleasing simplicity and high reliability. For although the unit may at first seem like an electromechanical product with all the pitfalls inherent in moving parts, the only movement is produced by electromagnetic forces—there are no linkages or connections causing movement. So essentially, as long as Maxwell's equations of physics remain in force, the plungers will be activated with high reliability. Reports from people who have been using the Dynatyper for a year or more indicate that few, if any, malfunctions can be anticipated.

The Dynatyper also comes with an external power supply, a parallel interface card and a cassette tape with the operating software. This is, perhaps, the only drawback to the system: operating the Dynatyper requires loading a 300-byte binary driver that controls the unit. As an alternative Rochester Data has just come out with a serial interface for the unit that eliminates the need for the operating software; however, this option costs about $200 extra.

INTELLIGENT VIDEO I/O FOR S-100 BUS



VIO-X

The VIO-X I/O Interface for the S-100 bus provides features equal to most intelligent terminals both efficiently and economically. It allows the use of standard keyboards and CRT monitors in conjunction with existing hardware and software. It will operate with no additional overhead in S-100 systems regardless of processor or system speed.

Through the use of the Intel 8275 CRT controller with an onboard 8085 processor and 4k memory, the VIO-X interface operates independently of the host system and communicates via two ports. The screen display rate is effectively 80,000 baud.

The VIO-X1 provides an 80 character by 24 line format using a 7 × 9 dot matrix to display the full upper and lower case ASCII alphanumeric 96 printable character set (including true descenders) with special characters for escape and control characters. An optional 2732 character generator is available which allows an alternate 7 × 9 contiguous graphics character set.

The VIO-X2 offers an 80 character by 25 line format using a 9 × 9 dot matrix allowing high-resolution characters to be used. This model also includes expanded firmware for block mode editing.

Both models support a full set of control characters and escape sequences, including controls for video attributes, cursor location and positioning, cursor toggle, light pen location, and scroll speed.

Video attributes provided by the 8275 in the VIO-X include:

- FLASH CHARACTER
- INVERSE CHARACTER
- UNDERLINE CHARACTER or
- ALTERNATE CHARACTER SET
- DIM CHARACTER

The above functions may be toggled together or separately.

The board may be addressed at any port pair in the S-100 host system. Status and data ports may be swapped if necessary. Inputs are provided for parallel keyboard and for light pen as well as an output for audio signalling. The interrupt structure is completely compatible with Digital Research's MP/M

FEATURES

- HIGH SPEED OPERATION
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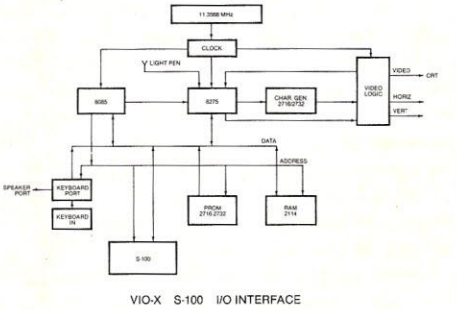

VIO-X S-100 I/O INTERFACE

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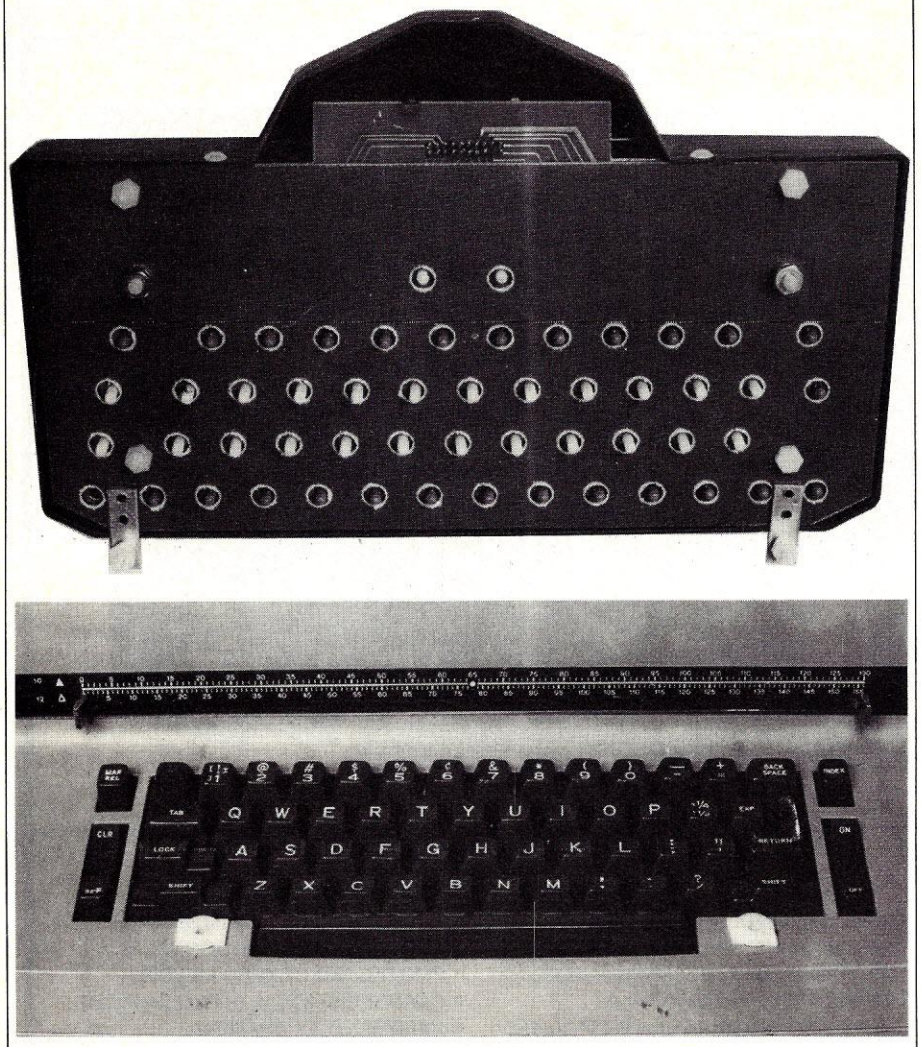
CIRCLE 265 ON READER SERVICE CARD

Dynatyper, continued...

The plungers protruding from the underside of The Dynatyper press the keys of the typewriter.



Two plastic washers, loacted on either side of the spacebar, are the only indication that the typewriter is being used as a printer.

Software

The operating software accompanying the parallel interface is embedded in a Basic program that allows the user to change the values of the delay constants affecting typing speed and also to locate the binary driver at a convenient location in the memory map. This may be a bit too much flexibility, however; for every time a user wishes to load the program, he must first set HIMEM so the binary driver can be safely tucked away, and then answer a series of questions concerning changing the delay constants. Normally, a user would want to set the appropriate values once, and then not have to worry about resetting them every time he uses the Dynatyper.

So I've found that a better solution is to substitute my selected values directly into the binary driver and save only the assembly language program, which can then be inserted as a subroutine in any program that would require the Dynatyper. Incidentally, this is what must be done if you want to use the Dynatyper with any of the existing word processing software packages on the market; these programs will not work unmodified with the Dynatyper. Fortunately, most suppliers of word processing software have agreed to modify or at least reveal how to modify their programs so they can be used with the Dynatyper. The manufacturers of Easy Writer, Apple Writer, and Magic Window have all been eager to cooperate.

My solution was to write my own word processing program which incorporates the Dynatyper's operating software.

Performance

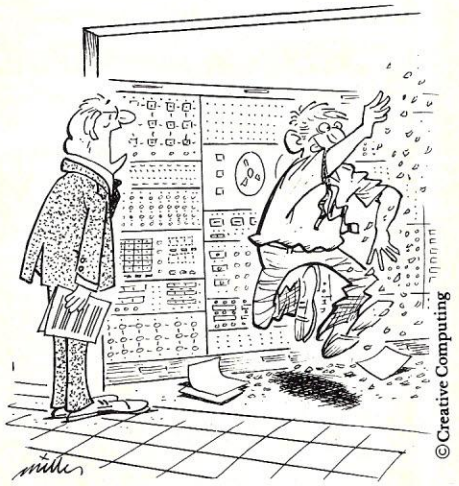
To insure a high level of performance from the Dynatyper, it is important that it be initially aligned properly on your typewriter. Otherwise, you may lose characters during output. Initial alignment only takes about a half hour, but it does require some experimentation to get the best configuration.

The first thing that must be done is to mount two white plastic washers on either side of the space bar of the typewriter using the cardboard template supplied. These two washers are the only indication that your typewriter is being used as a printer, and since they are attached with double-sided tape, they are easily removed. Into these two washers are placed the two bottom screws of the Dynatyper. The two top screws rest directly on the typewriter in such a way that the unit is held securely in place. With the cover off, these four screws are then adjusted by trial and error until every plunger, when pushed manually, activates its corresponding key on the typewriter. The plungers come in three different heights so the Dynatyper can be converted to different typewriters.

When the alignment is complete, you must determine the typing speed and setting of the separate delay constants. Although the Dynatyper can reliably activate its plungers at a rate of up to 50 cps, most typewriters are limited to a maximum typing speed of 15 cps before characters begin dropping out. Also, the return, tab and backspace keys should be made to delay many times longer than the other keys since they require longer activation times. I've found it best to operate my unit at 12 cps to reduce wear on my typewriter. At this speed, which corresponds to 140 words per minute, there are very rarely any missed characters.

Thus, for word processing applications where high speed output is not the most important concern, the Dynatyper interface is an effective and low cost alternative to a letter-quality printer. The Dynatyper sells for $499 for Apple and TRS-80 versions and slightly more for PET, OSI, Northstar and HP-85 versions. Included in the purchase price is a one-year, all-inclusive warranty and a set of thriftily produced manuals.

(Rochester Data Inc., 3000 Winton Road South, Rochester, NY 14623.) □



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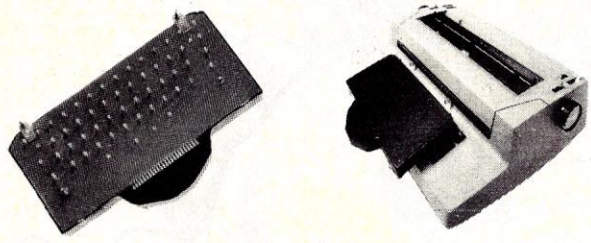

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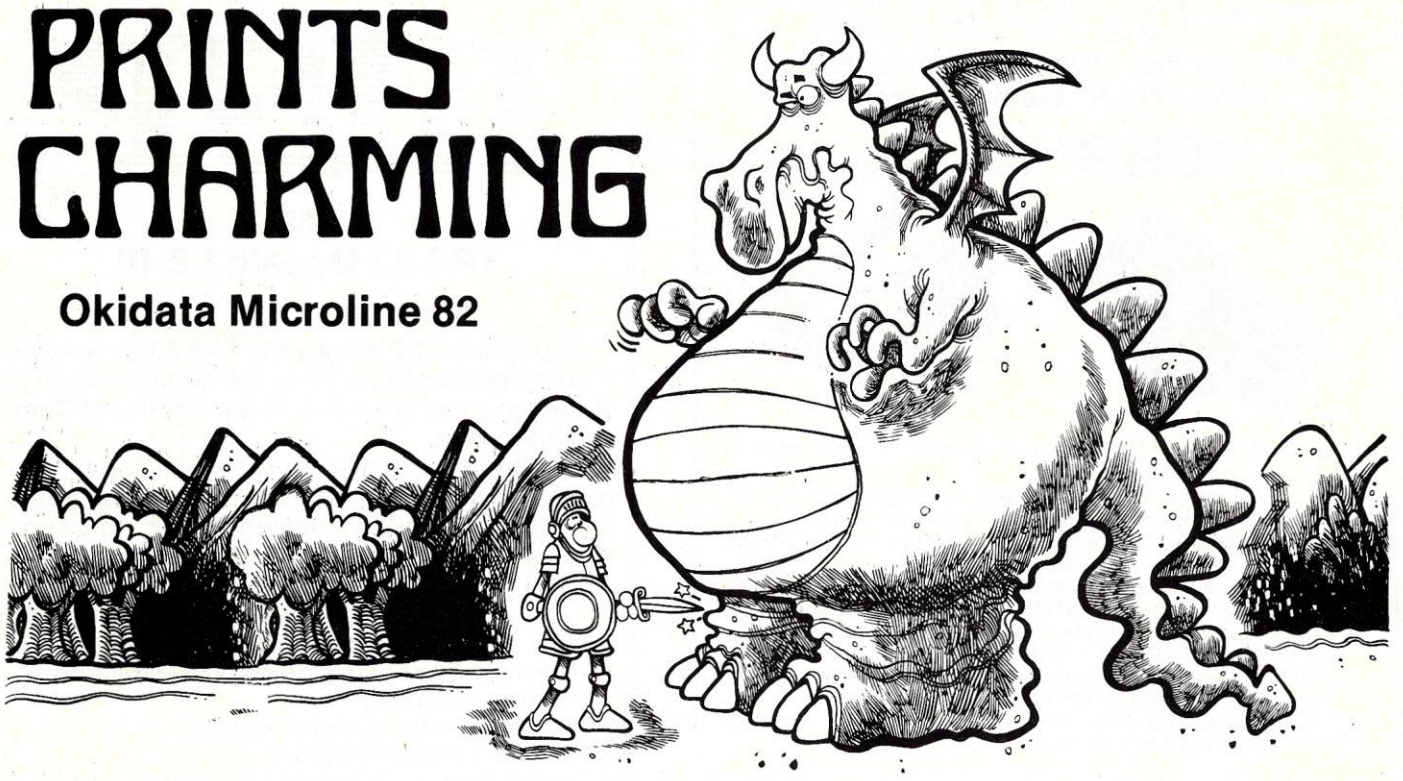

David Lubar

The arrival of a new printer is always an Adventure around here. Everyone immediately drops unimportant things such as programming and writing to cluster around the newcomer and offer observations, advice, and comments. The Main Character in the Adventure gets to set up the printer and test it, hoping it will obey his commands and perform as promised. In this spirit of discovery, let's take a look at the Microline 82 from **Okidata**.

The 82 arrived well packed, with no sign of damage or strain from the rigors of transport. The box contained the printer, a ribbon, and a 42-page manual. The ribbon was of the two-spool variety. It was installed with little difficulty, following the diagram on the inside of the access cover. At this point, we followed the traditional technique of trying to set things up without referring to the manual. While this approach is not advisable, it does offer an irresistible flavor of adventure and discovery. The 82 was attached to an Apple, using an Apple parallel interface card. We fed some paper through the pin-feed mechanism, crossed our fingers, and gave a command to turn the printer on. It worked. We ran some print loops and a short listing. The 82 cooperated, producing excellent hard copy at 80 characters per second. The character set includes lower case, but without descenders.

Next, we tried a long listing. Everything was fine for a page or so, then the ribbon started pulling up from the print head. Suspecting an operator error, we took a closer look at the instructions in the manual. Sure enough, we hadn't put the ribbon between the print head and the ribbon guard. After making the correction, the ribbon worked perfectly. It seemed time to take a closer look at the manual.

Figure 1. Printer Test.

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
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./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

TEST END

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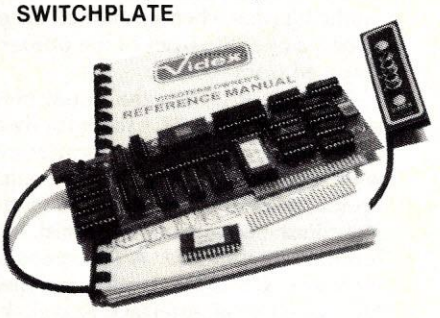

VIDEOTERM

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Firmware Version 2.0

Characters	7 x 9 matrix	Display	24 x 80 (full descenders)
Options	7 x 12 matrix option; Alternate user definable character set option; Inverse video option.		18 x 80 (7 x 12 matrix with full descenders)

Want to know more? Contact your local Apple dealer today for a demonstration. VIDEOTERM is available through your local dealer or direct from Videx in Corvallis, Oregon. Or send for the VIDEOTERM Owners Reference Manual and deduct the amount if you decide to purchase. Upgrade your Apple II* to full terminal capabilities for half the cost of a terminal. VIDEOTERM. At last.

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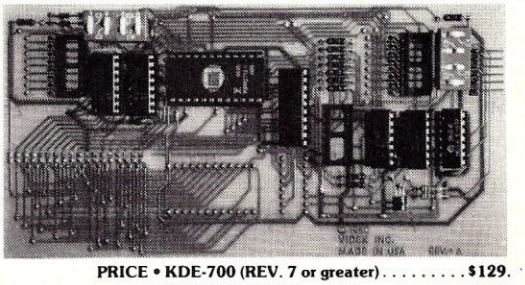

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The versatility of the 82 was quickly revealed within the first few pages of the manual. Under the section on specifications, we learned that line spacing and character spacing are program selectable. The print densities ranged from a condensed 16.5 characters per inch to double width characters at 5 cpi. Line spacing could be set for either six or eight lines per inch. There were also two line lengths. The long-line mode produced up to 132 columns, the short-line mode printed 106 characters per line at maximum character density.

At this point, we decided to run the self test. That seemed to be the best way to get a look at all available characters. The test is activated by turning the power on while pressing the line-feed button. The result (Figure 1) included a set of graphics characters. The 82 was beginning to look more promising than ever.

Further forays into the manual produced the information that graphics characters would be printed when the bytes sent to the printer had the hi bit set. We tried this on the Apple with no luck. The expected graphics characters didn't appear. It looked like the Adventure was leading us down a dark corridor. Then someone remembered that the Apple parallel interface grounds the hi bit. Rather than get out the solder and wire cutters, we took the easy approach and moved the 82 to a TRS-80. Again, the initial set up was simple. We just plugged in a parallel interface cable.

On the TRS-80, the printer immediately produced the desired graphics characters. These characters are formed in the same manner as TRS-80 screen graphics. Each character is divided into six blocks, and each block of the 2 x 3 rectangle can be set to black or white. Bits one through six control the six blocks. While standard characters are formed with a 9 x 7 dot matrix, graphics can be either 6 x 12 or 6 x 9, depending on the lines-per-inch setting.

Having gotten this far, we decided to try some program control of the printer. Initially, form length is set using a dial on the front of the printer, and top of form is set with a button. But these features can be changed by issuing certain control codes. Other codes allow you to pass parameters to the printer. For example, you can designate the number of lines on a page by sending the code for escape-F, followed by a two-digit value represented in ASCII. To set twenty lines per page, you would send the following decimal code string: 27, 70, 50, 48. All the controls we tested functioned properly.

Anyone looking for an inexpensive dot-matrix printer should take a close look at this product.

It's important to note that the printer will not automatically issue a form feed at the end of a page. Even if you have specified the size of the form and the number of lines per form, you must still handle any desired controls through software. This shouldn't be a problem, since most programs which control printers are already designed to handle such things. As can be seen in Figure 2, the Microline 82 had no problem printing a Scripsit file.

Another tour through the manual produced further wonders. The printer comes with thirteen character sets, including German, French, Swedish, Norwegian, and Danish. These sets include special alphabetic characters such as diphthongs. There is also an optional setting which can accept other character generators, and a setting specifically for the TRS-80. The diagram showed that several of the character sets included Kana. An example of these Japanese characters is shown in Figure 3.

Now, everyone who has ever been exposed to dot-matrix printers knows that they are not silent workers. How did the 82 do? Not bad. The noise was less than we expected. It seemed to be one of the quieter matrix printers. The sound was muffled further when we allowed the paper to drape over the front of the printer as it emerged from the top.

That about covers the initial meeting with the Microline 82, except for mention of available options. The printer comes with friction and pin feed. The pins are set for standard 9.5" paper. Roll mounting and adjustable tractor are optional. Parallel interface is standard. A low-speed serial interface (RS-232C) is also included. A high-speed serial interface is available as an option.

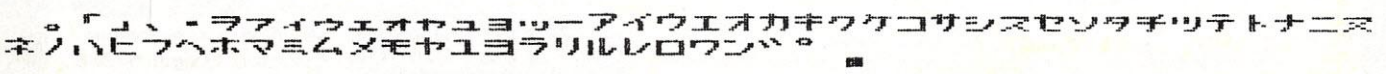
For those concerned with aesthetics, the Microline 82 is an attractive, compact unit. The front contains an inset panel with a form-length knob, and switches for form feed, line feed, top of form, and select-deselect. The power switch is on the back, as are the interface ports.

Summing it up, the Microline 82 is a versatile printer with many good features. Anyone looking for an inexpensive dot-matrix printer should take a close look at this product. It might be just what you've been waiting for. While we haven't had it long enough to comment on reliability or service, the unit does seem sturdy and well designed. We'll keep you posted on the results of long-term use. The Microline 82 lists for $649. The 82-A, which is scheduled for introduction in July, will have a 9 x 9 matrix with true descenders and a print speed of 120 cps. The projected list price of the 82A is $799. □

Figure 2. Microline meets Scripsit.

```
        This is an example of the print quality of the
Microline 82. The file is being printed out under SCRIPSIT
with the right margin justified. Notice the compact
arrangement of dots in the matrix, avoiding that familiar
computer-generated look. While there are no descenders, the
letters are readable and well formed.
```

Figure 3. Kana character set.



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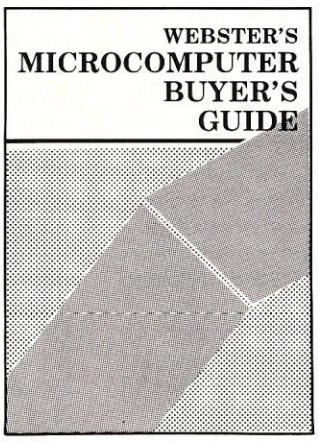

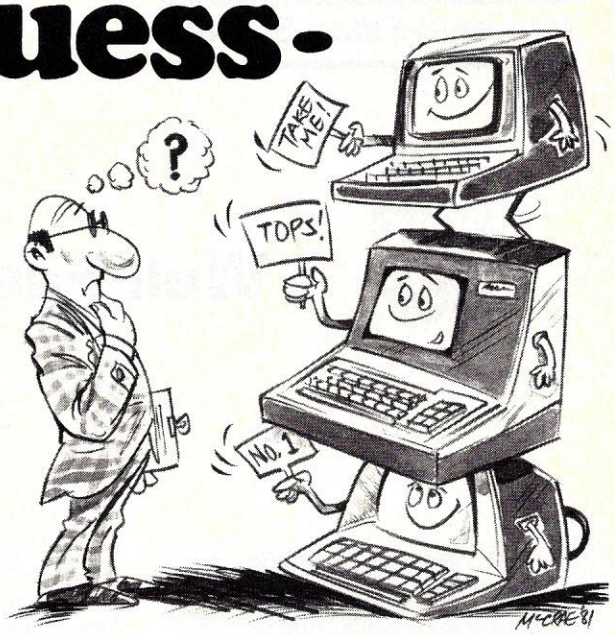

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A great many software companies seem to be offering some form of data-base program. These programs vary from highly-specialized software for specific types of data to general-purpose programs capable of handling a wide variety of information. Some are simple to use while others practically require a degree in computer science or the equivalent. *PFS*, a generalized data base, is user friendly and quite elegant.

This program was definitely designed with the user in mind. Its strongest feature is the way it treats information. Your data are stored in forms which you design. There are no requests for field specifications, record numbers, variable types or other parameters. To get started, all you have to do is design a form, any form at all. Each form resembles a sheet of paper, and is created right on the screen. If one page isn't enough, you can add more. The form is designed simply by typing in the headings anywhere on the screen. The only restriction is that you should leave enough space between headings to accommodate the data that will be entered. Since forms can be more than one page, this is no great restriction.

Once a form is designed, it is saved on a disk. Then, whenever you want to enter data, you just fill in the form. There are no restrictions against characters in the data; commas and quotation marks can be entered without causing any trouble. This is another sign that *PFS* was designed with the user in mind. Once any individual item has been entered, the right arrow key tabs to the next heading. This is simple and elegant. Of course, there is more to a data base than just entering information. You also have to be able to search, change, and delete items.

The search mode of *PFS* is very well designed. You can search for a complete match on any item or a combination of items from different headings, or search for partial matches. Suppose you have a mailing list stored on *PFS*, and want to find all addresses on PINE ST. (Entries are in upper case.) All you have to do is bring the form onto the screen, move the cursor to the address heading, and enter ..PINE.. as your search parameter. This would turn up any entry containing PINE as part of the address. Let's say you have a list of names where the first name comes last. To find all the SMITHs, you could search the name field for SMITH... To find all the JOHNs, the command ...JOHN would be used. Items can be entered in more than one heading, allowing, for example, a search for all SMITHs who live on PINE ST and are 65 years old. Numerical sequences can be found even if the search parameters leave out intervening characters such as commas. You can also search for numbers that are greater or less than a specific number.

Once a form has been found with a search, you can make changes, or delete an entry from the disk. The form concept allows great flexibility when making printouts. You can have the forms printed with or without headings, you can request printouts of only part of the form, you can specify a line feed or just a space between items, and you can print items found in a search or print all items. As an example, suppose you have a form containing complete ordering information for business customers. By requesting a printout of just name and address, you've turned *PFS* into a mailing-list generator.

A backup utility is provided which allows users with two drives to copy data disks. *PFS* also initializes new data disks from within the program, avoiding the need to prepare disks beforehand.

One aspect of the program might prove slightly inconvenient for experienced Apple owners. Instead of using RETURN, the program uses CONTROL-C to signal that you are done with a form. It takes a bit of getting used to. Luckily, hitting RETURN by accident does no damage. It's very hard to lose data in this program. In general, the whole system is very forgiving of mistakes. The only potential for losing data occurs if you exit the system without saving the most recent entry. In this case, you would lose only the form that was just filled.

The documentation includes an example showing how to generate a mailing label. More needs to be said about the booklet. Except for the lack of green ink, it greatly resembles Apple documentation, both in layout and quality. The pages of this spiral-bound manual are filled with screen photos and other helpful information. The user is gently stepped through all aspects of *PFS*.

While all this sounds almost too good to be true, there are some functions that are lacking in *PFS*. It has no sorting capability, and it does not allow any manipulation of numerical entries. For instance, you can't obtain the sum of all entries for a specific heading. But these limitations are minor or inconsequential in most cases, and are more than compensated for by the speed and utility of the program. For general use, whether at home or in the office, *PFS* is an outstanding program.

Creative Computing will be covering more data bases in future issues. If the above software doesn't meet your needs, keep watching. □

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It seems as though most of my mail these days comes with stick-on address labels printed by a computer. Now I'm not one of those multi-million dollar department stores that load suburban post offices with millions of flyers addressed to "occupant," but I have occasionally wished that my little Apple II could print address labels for me so that some of my outgoing, as well as my incoming mail, would have those neat little printed labels.

Perhaps Amy Vanderbilt would consider it gauche to address Christmas cards with computer-printed labels. Still, the music department at my church does mail out notices of concerts; and the church choir has contributed many hours of labor sorting those mailing pieces by zip code so we could get a better postal rate.

And in my small business, from time to time I would like to send promotional mailings of a few hundred pieces; but I can't really afford the secretarial help to type the address labels each time, and then sort them out by zip.

So I was eager to try out a new mailing list program, "Mailbag," sold by Systems Design Lab of Redondo Beach, CA. The price was only $35, and the salesman at my friendly, local computer store thought it would exactly fill my need to deal with mailing lists of a few hundred names each.

The salesman was right—or at least mostly right. Mailbag can handle between 215 and 265 names on a 48K system in a single run; and, of course, it can handle more names than that in multiple runs. It has provisions for entering, editing, sorting, and deleting names as well as printing address labels, and can be interfaced with some word processors to produce addressed form letters.

Documentation

Like so many commercial microcomputer programs today, its documentation is weak, so let me discuss that before I describe some of the better functions in more detail. The user's manual has 23 pages, most of them devoted to a description of each of the twelve program functions in turn. In general, these descriptions are clear and complete, but occasionally an explanation will be a bit cryptic, or a piece of information will not be available.

The "Add More Names" description does not explain the use of the ESC key as a shift key, for example, and the "Build New Database" description makes only passing reference to this use of the ESC key. Yet these are the two sections in which users will most likely be looking for that information.

The "List/Search/Print Routines" description does not clearly describe the mechanics of entering a "Search" request; users must read through the examples provided to realize how it is done. There are other instances, but like these examples, they are relatively minor, and I understand, from a phone conversation with him, that the author is aware of these weaknesses and is revising the manual.

When the manual is revised, I would like to see it include a "beginner's tutorial" to take new users through a "practice run" of the program step-by-step. I would also like to see an index. In any manual users cannot be expected to know precisely where some obscure bit of information may be located.

In any case, the documentation for this program is at least clear enough that intelligent users can make the program work reasonably well.

Program Functions

Now let me describe the various program functions in more detail. There are two routines for entering data, one (Option A) to "Add More Names," and one (Option B) to "Build a New Database." Their operation is quite straightforward: the user is presented with a menu on the left-hand side of the screen and enters the information on the right-hand side.

If an entry is too long for the space on the screen, it "wraps around" and proceeds to over-write the menu, but the computer accepts the full entry correctly. The only disadvantages are that the user must remember what the next entry is supposed to be (e.g., city or state), and that when the menu is presented for the next item, blank areas in the original menu will be filled with whatever had overwritten them (e.g., I had an "ADDRESS INC.:" for a while as a part of my menu in one run where there had been just "ADDRESS :"). The nuisance is temporary, and disappears when the next routine is called.

Option D ("Delete Existing Names") and Option M ("Modify Existing Names") are also reasonably straightforward. Each one displays the record and gives the user the option of changing his mind and making no deletions or changes in the record. Option M presents the user with a menu on which to enter changes. It also has an undocumented but very useful feature: a carriage return leaves the rest of an item unchanged, and takes the user to the next item on the menu.

Option R ("Read Names/ Letters from Disk") and Option W ("Write Name Data to Disk") take care of file handling, saving data in text files on the disk. The users should get in the habit of routinely replacing the Mailbag disk with an ordinary DOS

Brownlee Elliott, 2694 Brady Drive, Bloomfield Hills, MI 48013.

disk after loading the program—both to save wear and tear on the Mailbag disk and to facilitate file handling. Perhaps the hardest part of the file handling routines is remembering file names; but Mailbag has a routine, "Catalog (DOS)" which provides a list of the files on the active drive. It is also relatively simple to switch from one drive to another, though apparently not from one slot to another.

Option S is a sort program which sorts the entries into any of several possible orders: last name, title (or company—what the program calls "second name"), city, zip code, or "optional code" (an arbitrary code set up by the user).

The sort program does not specifically eliminate entries. It does not, for example, pick out only entries with zip codes less than 48000. But careful use of the list program (described below) along with the sort program will do this, since the list program can print a selected range of entries based on whatever their order happens to be at the time of the list request.

There are three other minor routines: Option G ("Global Print Functions") which sets up such parameters as mailing label size and salutation to be used on form letters; Option P ("Printer Mode On/Off"), which toggles between the screen display and the printer; and Option X ("Exit Mailbag") which takes the user out of Mailbag and into Basic.

Option X illustrates another very helpful feature of Mailbag which appears in several other places in the program: before the routine runs, the user is asked if he wants to save the data in a disk file. He does have to say "no" to this query by simply repeating the original request.

Option L ("List/Search/Print Routines"), is as the manual says, the "heart" of this program. It can produce, either on the CRT screen or on the printer, a list of complete entries, a list of names and phone numbers, or a list of mailing labels. Any list can include all entries, or a range of entries based on the order in which they happen to be arranged at the time of the List request.

Perhaps Amy Vanderbilt would consider it gauche to address Christmas cards with computer-printed labels.

Option L can also produce a "customized" form letter, with the date, salutation, and such items as inclusion of first name, last name, and title specified. I did not test this option, so I cannot describe how well it works; but it will only work with specific word processors—those which produce text files rather than binary files (and I would assume that it does not necessarily work with all text file based processors).

I had one initial problem with the program which a more astute user might have avoided: when I printed mailing labels, every "p" was deleted, along with whatever character followed the "p." I wrote a letter to the author, and got a phone call from him the next day; the problem, as it turned out, was that I needed to make a change in one line of the program because I was using a parallel interface card. The change is explained in the manual, but I had overlooked it.

Of course, I suppose we users cannot reasonably expect complete product testing and documentation from micro-entrepreneurs the way we can expect, and even demand it, from the IBMs of the industry. But we can expect pleasant, prompt help with our problems, and it's nice to report on one company, and one author, who give such help.

So, for $35, Mailbag is a first class investment. It works well, with no bugs that I could detect. Its documentation is adequate, and presumably will be improved. It gets my—ahem—postal stamp of approval. □

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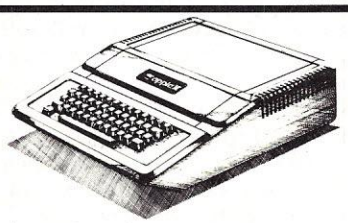

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APPLES CAN BLOSSOM DAISIES

Jamie Tietjen

With all the expensive (and sometimes troublesome) letter-quality printers on the market today, the Radio Shack Daisy Wheel Printer II stands out as a brick-solid bargain. No other printer gives you 126 letter-quality characters, multi-pitch and proportional spacing, 132 columns, and all metal construction for under $2000 ($1960, to be exact). So, when a friend bought one for his TRS-80 Model I, and then decided to use it with his Apple II Plus as well, I was excited. I was sure that the high quality combination of Apple/Daisy would outshine the TRS-80/Daisy pair, since the owner was having chronic problems with his three drive TRS-80.

When he tried it on the Apple, nothing worked correctly. All he could print was random and spurious garbage. After I agreed to help, I wondered what could possibly be wrong: he had the standard Apple parallel printer interface card with a Centronics cable. All hardware and firmware was for Centronics printers, and the printer is Centronics-compatible, yet only garbage made it to paper.

Then I noticed that the garbage characters being printed were only the special non-ASCII characters available on the Daisy Wheel printer. A quick check of the printer manual showed that these characters all had their most significant bit set high (bit 8). The standard procedure to print normal mode characters on the video screen (not inverse or blinking) on an Apple is to set bit 8 high. This causes the ASCII characters to have values from 128 to 255, which are the special characters on the Daisy Wheel printer.

"Simple fix," I thought to myself. "Just a tiny 'filter' patch for the printer firmware to reset bit 8 low and we will have a functioning ASCII printer. Add a mode flag and we can print the special non-ASCII characters under software control."

An hour and a half later I discovered why it wouldn't work. The firmware on the printer interface card has a bad habit of setting bit 8 high on anything it prints, foiling all attempts to use the firmware. I didn't have access to the assembly listing of the Centronics firmware, only the standard parallel firmware, so I didn't feel confident I could rewrite it quickly enough.

To get things going quickly I fell back on a simple hardware fix. The fastest way would be to disconnect the bit 8 line between the card and the printer, and then tie the bit 8 input on the printer to ground. This could easily be done at the printer end of the cable, leaving the disconnected bit 8 line taped out of the way. This does not alter the card in any way, leaving the warrantee intact. Another, more flexible, way is to insert a switch. This would allow you to correct the problem in one position, yet still be able to flip the switch and test (or use) a software driver.

Table 1 is a pin-for-pin list of interface card to Centronics Amphenol male plug connections, most of which should already be made on Apple-supplied Centronics cables. (They very easily could not be: the card end of the cable I had was assembled backwards, as well as having the ACK line misplaced on the printer end!)

Figure 1 shows the switch schematic. The switch will be removable if its wires are connected to the pins inside the printer plug of the cable. This puts the switch at the printer, not at the Apple, but it really isn't used very much and doesn't get in the way there. I put it in a little plastic box at the end of a foot of wire and it has been fine.

```
!"#$%&'()*+,-./012345678
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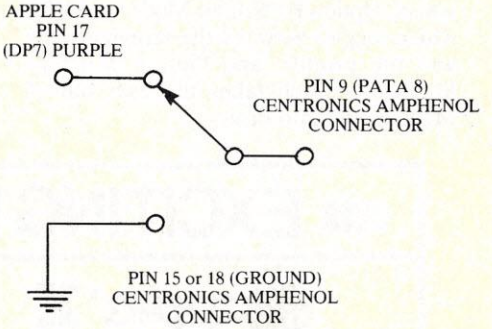

Figure 1.

The Apple has indeed blossomed with the addition of letter-quality printer. It's nice to know you don't need a fat green wallet to get your Apple to grow. □

APPLE INTERFACE CARD			CENTRONICS CONN. CABLE	
Pin #	COLOR	NAME	Pin #	NAME
1	BROWN	GROUND	14	GROUND
2	RED	ACK	11	BUSY
8	GREY	STROBE	1	NOT STROBE
10	BLACK	DP0 (LSB)	2	DATA 1
11	BROWN	DP1	3	DATA 2
12	RED	DP2	4	DATA 3
13	ORANGE	DP3	5	DATA 4
14	YELLOW	DP4	6	DATA 5
15	GREEN	DP5	7	DATA 6
16	BLUE	DP6	8	DATA 7
17	PURPLE	DP7 (MSB)	SPDT	SWITCH (ON-ON)
20	BLACK	GROUND	16	GROUND

Table 1.

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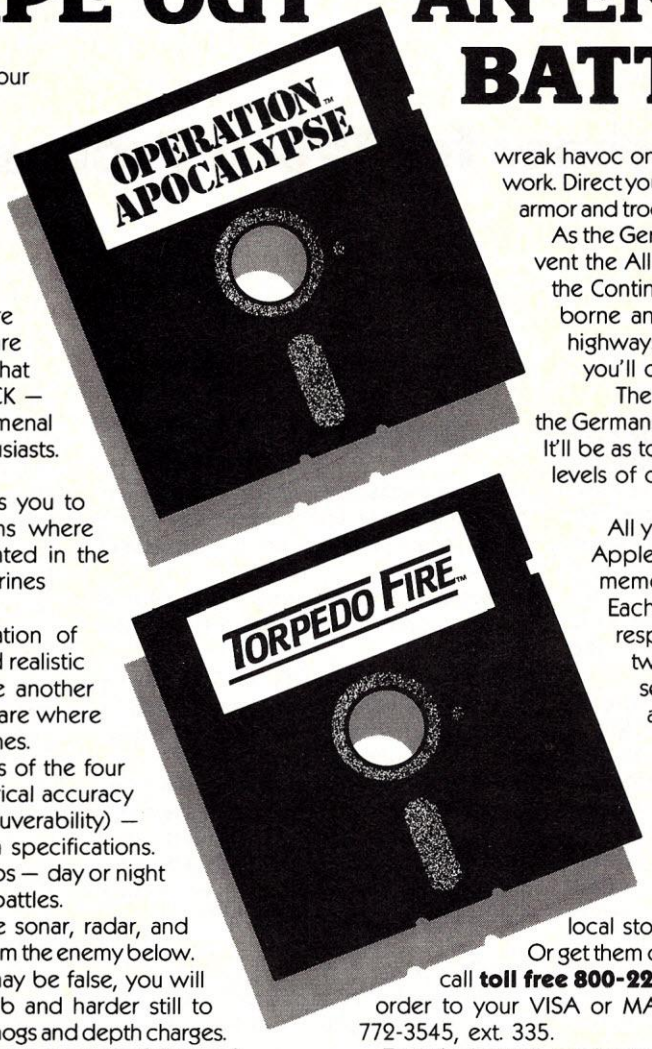

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CIRCLE 201 ON READER SERVICE CARD

A Primer for Word Processing

Gordon Mc Comb

The old adage, "You can't please all the people all of the time" is definitely true about word processing programs. Whether used in education, engineering or business, the value of a word processor is beyond question. But choosing the right program for your individual needs is no easy task. A program which is perfect for one application may be worthless for another.

Enter the article you're now reading. If you don't know how merging, justification, glossaries or embedded commands can help you with your business or personal word processing needs, then by all means, read on.

Word Processing programs are among the most used programs for micro and mini computers. But many users, unsure of the meaning of certain features or the extent of their capabilities, often choose a program more or less at random. It it simply a matter of matching your needs with the capabilities of the program.

Before We Begin

In selecting the right software to satisfy your needs, two things must be taken into consideration: First, the type of documents you will be preparing; the vast majority of text written on word processors is the standard letter or manuscript variety. If your use is more specialized, you should be aware that some of the features necessary to perform complex functions are beyond the scope of many word processing programs.

For instance, if you write specifications for the construction of buildings, you will most likely want to use an extended outline form. Some programs may not be able to format text in this fashion. If you are an engineer or chemist, you will need superscripts and subscripts (letters and numbers half a line above and below regular type). Again, some programs are not capable of this.

Gordon Mc Comb, 410 Escondido Avenue, Vista, CA 92083.

Secondly, your computer and peripherals must support the features of the software.

A typical system might include a computer with a minimum memory of 32K, a floppy disk for data storage (either 5 1/4" or 8") and a printer.

A sufficient amount of memory is needed for the resident computer operating system, the word processing program and the text itself. With anything less than 32K, you may find yourself limited to processing only a dozen pages or so at a time.

The Printer

Your choice of a printer will be the most important factor in determining the compatibility of software and equipment. The kind of printer you choose will be dependent on the quality you need in the finished product. Daisy-wheel printers (starting at $2,000) will give you moderate speed and excellent type quality. Dot matrix printers (starting as low as $400) will give you faster speed, but less quality because the characters are composed of small dots.

Another possibility is a modified office typewriter, such as an IBM Selectric. A special base plate or hood containing dozens of "typing fingers," is attached to the typewriter and connects to the computer. The add-on plate or hood won't affect the normal operation of the typewriter, so the machine can perform double duty—as a word processing printer and a regular ofice typewriter.

Most printers may have some limitations when it comes to supporting software features. For instance, a few daisy-wheel printers, although designed for word processing programs, aren't capable of proportional spacing (each character is spaced according to its width; "i"s take less space than "w"s) and your program may include that feature. It is unlikely that you can get a modified typewriter to print subscripts, and a dot matrix printer has trouble doing boldface. Get specifications on the printer before buying to make sure it will be able to take full advantage of the features of the program.

Inside Views

The following are features commonly found in word processing programs. Unfortunately, the terminology used for word processing features is not standard and descriptions of certain capabilities can be misleading. When buying software, ask the dealer for an explanation of the features in question. When a program is said to have "automatic indenting," will it automatically indent at the beginning of each new paragraph, or indent on *every* line? Whenever possible, try out the program before buying. Like a well-tailored suit, it should fit you well.

Password

You can control the use of your recorded documents by giving them password protection. You can select any or all of the files on a diskette to be locked in, accessible only by a coded message—and the password can be different for each document.

Upper and Lower Case

When you power up the computer and load the program, you may find a variety of ways to display the characters on the screen. Some systems may show both upper and lower case. Some may show capital

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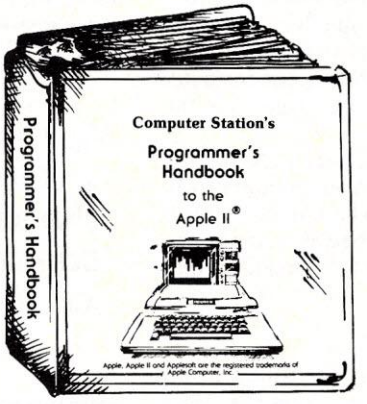

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CIRCLE 149 ON READER SERVICE CARD

letters only, and you have no way of distinguishing between upper and lower case. Still, other programs display all caps, but characters appear black within small white blocks. This is called "reverse video" and is used to denote capital letters within the text.

Upper and lower case capabilities are mainly a hardware consideration, but your program must be compatible with your hardware to operate properly. If, for example, you have modified your computer for upper and lower case, make sure the program will run with it.

However, capital letters only on the screen does not mean your computer will print out only caps. The computer itself knows the difference between upper and lower case; it's the video monitor that may be confused.

Screen Loads

The amount of text contained in an entire screen on the video monitor is called a screen load. The number of characters in a line and the number of lines per screen will vary from one computer to the next. Again, this is something inherent in the machine itself, your software won't have much control over this.

With most computers, two or three screen loads will make up one single-spaced page. The way your program handles the text is an important consideration. Some see the document as an entire page, and you "flip" through the screen pages one-by-one as you write or look over the material. This is called page scrolling. Other programs move your text one line at a time. This is called vertical line scrolling. There are no actual pages with this method; the document is one long "scroll" of text.

Wrap Around

As you type, you may notice you don't have to push the "return" or "enter" key each time you end a line. If a word exceeds the maximum screen width, it will wrap around onto the next line. The program will never split a word, so as you add and delete words, the computer re-formats the text, wrapping everything around as needed.

Split Screen

Since you can view only a small portion of the document at a time, some programs have added a split screen feature that allows you to see one part of the document while you look at or edit another part. This is a handy feature when you're moving text around, checking for continuity, transitions, etc.

You can change the way a document is printed the same way you can control its appearance on the video monitor.

Mode Control

Word processors do three basic things: write new text, edit text and jump from one part of the text to another. These functions are often referred to as "add," "change," and "cursor movement." You might also see them as "write," "edit," and "cursor control." A few programs make it possible to be in all three modes at once. Others require you to shift between modes as you work with the document. This is not as burdensome as it sounds, but check the "feel" of the program before you take it home. Some software packages have very complicated control sequences.

Cursor Control

An important aspect of your word processing system is the ease with which you can position your "pen" (cursor) at the point where you want to write or edit. You can manipulate the cursor to move left, right, up and down—all without affecting the text. You may also be able to move the cursor directly to the end or start of a line or the beginning or end of the document. Programs that are page-oriented allow the cursor to jump to any desired page.

Orientation

A program that allows you to display and change lines, either by making a change within the line, or by replacing the entire line, is a "line-oriented" word processor.

```
This is a sample of justified
text. Both the right and left
margins are even.  To avoid ex-
cess space between words, it's
often handy to have a hyphena-
tion capability.  That puts more
words on each line.

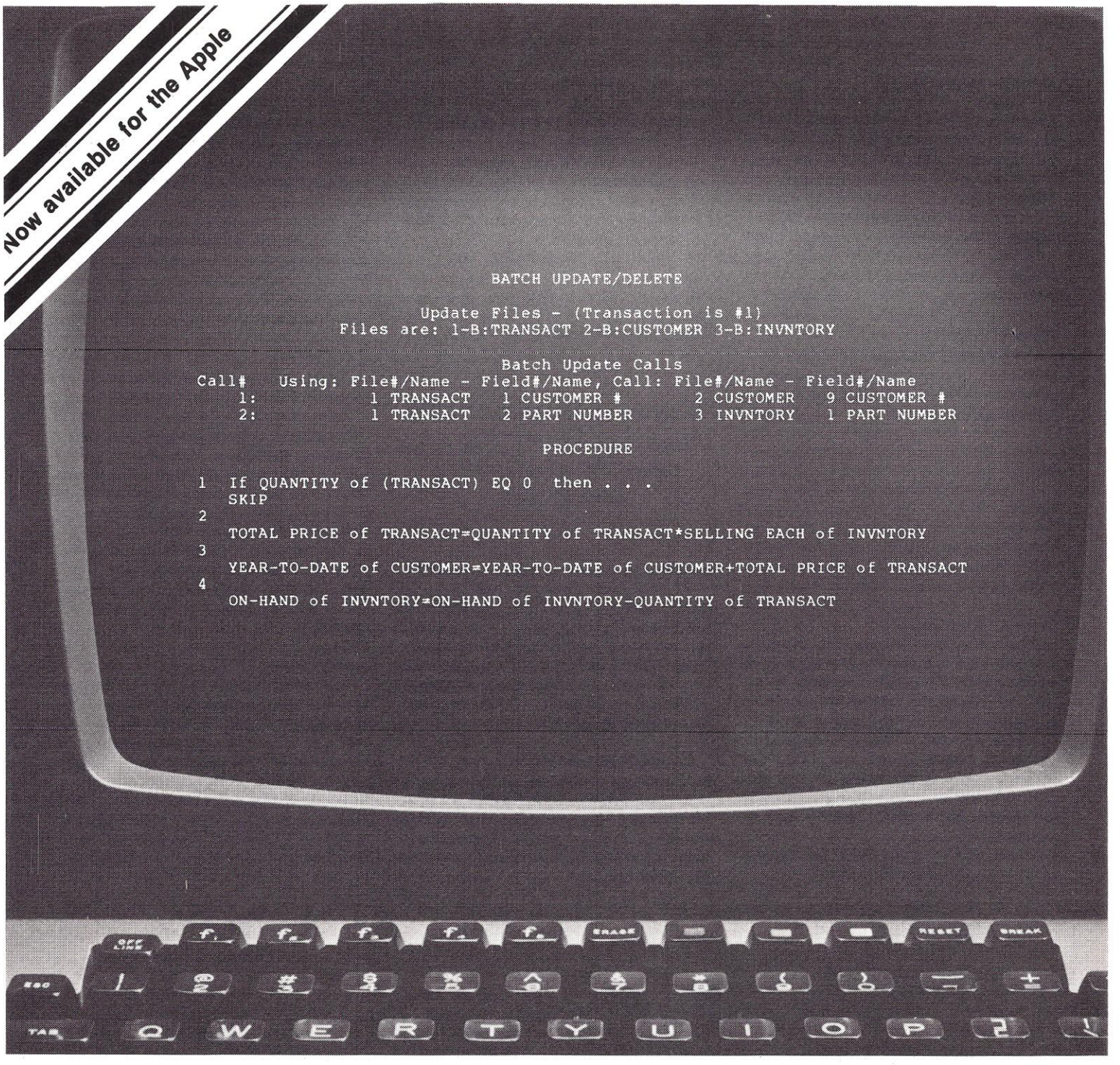

    This shows centered text.
  Good for title pages, main
          document
      headings, and more.


This shows flush right margins.
   Instead of the typical flush
left, it puts each line even on
                the right margin.
```

```
>*primer on word processing._ ──────────── Comment Line
>J=N LM=11 RM=74_┐
>C=Y LS=2_       ┘──────────────────────── Embedded Commands
A PRIMER FOR WORD PROCESSING_
How to Choose the Right Word Processor_
For Your Micro or Mini Computer$

Written By_
Gordon Mc Comb$
>J=N C=N_ ──────────────────────────────── Embedded Command
_
     The old adage, "You can't please all the people all of
the time" is definitely true about word processing
programs.  Whether used in education, engineering or
business, the value of a word processor is beyond reproach.
But choosing the right program for your individual needs is
no easy task.  What's perfect for one application may be
worthless for another._
     Enter the article you're now reading.  If you don't
know how merging, justification, glossaries or embedded
commands can help you with your business or personal word
processing needs, then by all means - read on!\
[HS>──────┐
Mc Comb   │          [P>##][2>]        WORD PROCESSING PRIMER_
$ Header Instruction Command └──────────────────────────┐
]_                                                      │
     WP software is some of the most utilized programs for
micro and mini computers.  But many users, unsure of the
meaning of certain features or the extend of its
ca                                                      │
                                                        │
                                                Page Number
                                                Command and
                                                Start Point
                                                        │
                                                        │
                                                Header Text
```

Text and Format Lines. This is a typical printout of text, invisible (comment) lines and embedded commands. This particular document was prepared using Radio Shack's Scripsit for the TRS-80 Model 1. By following the syntax instructions for addressing the program, the user can control all margins, centering, line spacing, etc. Mastering a word processor like Scripsit takes only a couple short hours.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Files are: 1-B:TRANSACT 2-B:CUSTOMER 3-B:INVNTORY
Batch Update Calls
Call# Using: File#/Name - Field#/Name, Call: File#/Name - Field#/Name
1: 1 TRANSACT 1 CUSTOMER # 2 CUSTOMER 9 CUSTOMER #
2: 1 TRANSACT 2 PART NUMBER 3 INVNTORY 1 PART NUMBER
PROCEDURE
1 If QUANTITY of (TRANSACT) EQ 0 then . . .
SKIP
2
TOTAL PRICE of TRANSACT=QUANTITY of TRANSACT*SELLING EACH of INVNTORY
3
YEAR-TO-DATE of CUSTOMER=YEAR-TO-DATE of CUSTOMER+TOTAL PRICE of TRANSACT
4
ON-HAND of INVNTORY=ON-HAND of INVNTORY-QUANTITY of TRANSACT

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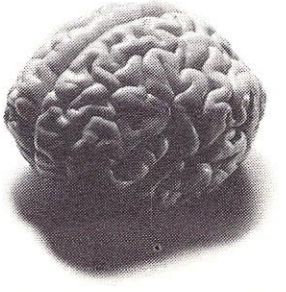

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CIRCLE 167 ON READER SERVICE CARD

Often this type of program functions in the same manner as the Basic editor found in most computers. If the program allows you to move the cursor to any part of the screen display, it is character-oriented. This approach allows for faster and easier editing. Phrases such as "page-oriented" and "screen-oriented" also refer to the ability to work with a screenful of text with total cursor control.

Screen Formatting

To make it easier to visualize how a document will look when printed, many programs make it possible to change the appearance of the text on the screeen. You may be able to format the document for 10, 40, or even 100 characters wide. In the case of the line which includes more characters than the width of the screen will allow, the program will scroll the text horizontally over one character at a time as you type. This is very much like a movie panoramic effect—with words instead of mountain ranges.

Printer Formatting

You can change the way a document is printed the same way you can control its appearance on the video monitor. User-defined parameters (instructions on how to output the text) are vitally important because they control the final appearance of the document. As a minimum, you should be able to change the line spacing, line width, page length, number of lines per page, and top, left, right and bottom margins.

Other special features for formatting which may be available include:

Flush Right where the standard even margin is on the right side.

Justification, which provides even margins on both right and left sides.

Centering, which centers each line in the middle of the page—handy for titles and so forth.

Vertical Centering, which takes the entire document page and centers it in the middle of the sheet. No more top heavy letters.

Your program should be capable of inserting and deleting characters and words.

Normally, the computer will set up all of the screen and printer formats when you power up the system. It will assume you want to use the program in the "normal" fashion. These are called defaults, and unless you tell the computer otherwise, it will perform all the functions as specified by the manufacturer.

Tabs and Indenting

You should be able to select tab positions the same way you do with a regular typewriter. Some programs allow only a certain number of pre-selected tabs; others make it possible to select tab stops at any character position.

Required tabs—sometimes called auto indenting—place every line at the tab position you have selected. Writers of outlines and reports will use this capability extensively.

Paragraph indenting—incorrectly called auto indenting by many manufacturers—simply indents each new paragraph. When you hit the "paragraph" key, it will automatically position only the first line at the indented position.

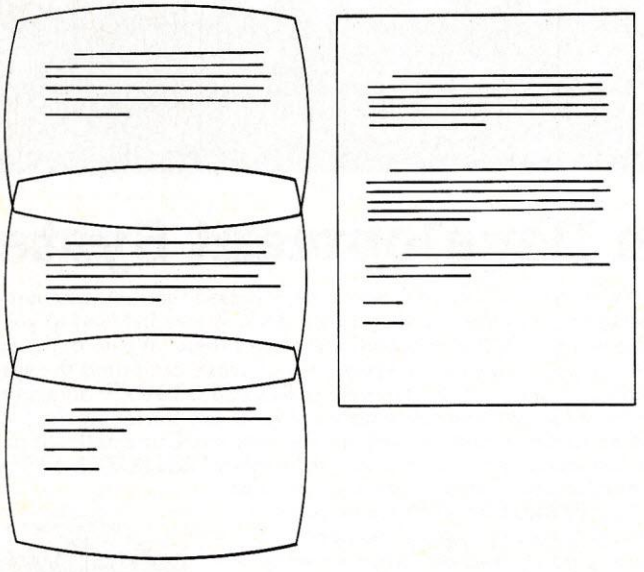
Local Editing

Your program should be capable of inserting and deleting characters and words. It might also be capable of dropping or adding entire lines, paragraphs and pages. These one-at-a-time changes are called local editing functions. Position the cursor where you want to make the change, key in the commands and the edited version will appear on the screen.

The simplest editing function is the strikeover feature. If you make an error, such as "the" instead of "the," position the cursor over the "e," and type in the correct spelling.

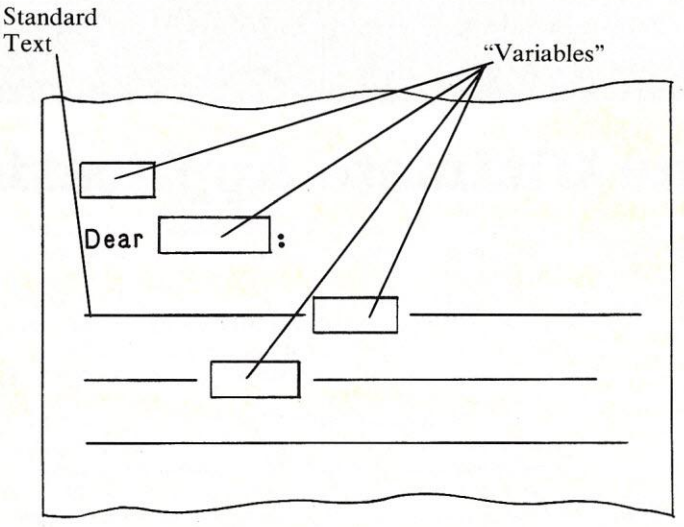
Global Editing

Let's say you must change the spelling of a person's name which occurs many times throughout a lengthy document. Instead of looking for every occurrence of the name and making each change manually with local commands, you can instruct the computer to perform a global editing function. There are three types: search or find, delete and replace. With this example, you would use the global replace function. You would tell the



3 computer screen loads = 1 single spaced page

Typical Screen and Page Configuration. The amount of text contained in one screen most likely will not equal one entire printed page. For most systems, you'll need to fill up two to four screens to equal one single-spaced typewritten page.



Merging Print. The operator first writes a primary document which includes the basic text plus all variable commands. Then, the user creates the secondary file document, which contains all the information that will be included in each variable slot.

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Back when *Byte* was first publishing independently, *Creative Computing* and *Byte* cooperated in many areas. We ran joint promotions, directed articles to each other and the like.

In 1976, Creative published *The Best of Creative Computing, Volume 1*. I proposed to Virginia Londoner, publisher of *Byte*, that we also publish articles from *Byte* in book form. She agreed, and so we published *The Best of Byte, Volume 1*. It's a huge book of 386 pages with articles on hardware, software, technical tutorials, how-to materials and even some philosophy.

Although some of the technical material in *The Best of Byte* is out of date today, it nevertheless provides a good historical framework for the personal computing field. Not at all out of date are most of the software articles and tutorials. Similar books of other publishers are selling for $20 and up, so at $11.95, this one is quite a bargain.

Big Hearted

About the same time we were preparing *The Best of Byte* for publication, Nat Wadsworth of Scelbi approached Byte about doing a similar book. Virginia wanted to be nice to everyone, so she gave permission. Thus was born the *Scelbi-Byte Primer*.

Unfortunately, about half of the content of the two books was identical. Thus *Byte* was faced with a dilemma of which book to endorse and sell through their magazine. Inexplicably, they chose the Scelbi book. Thus we were left with twelve skids of *The Best of Byte*.

Hidden Away

In the next three years we sold a lot of these books. In fact, after we ran a special in 1979, we thought we had sold out.

However, we just moved to new quarters. In the move we found, lurking away in the back of our old garage, four skids of *The Best of Byte*. After some fitting words, the boss said "for 2¢, I'd give them away." So that's what we're doing.

Our Ridiculous Offer

The original price of *The Best of Byte* was $11.95. If you order $11.95 worth of any of our other books or records, we'll throw in *The Best of Byte* for 2¢.

Thus you could order *The Best of Creative Computing, Vol. 3* ($8.95) and *Computer Coin Games* ($3.95). The toal price is $12.90. For $12.92 you also get *The Best of Byte.* Shipping and handling on all book orders is $2.00.

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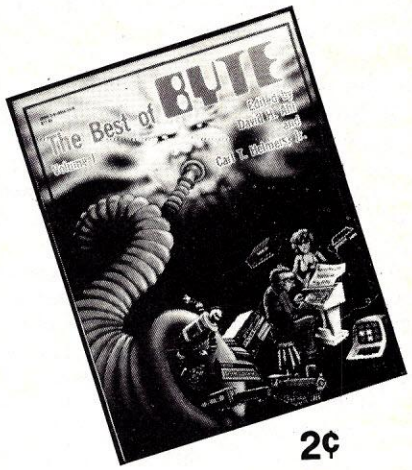

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computer what name to find, and how to change it. The machine does the rest.

Global search allows for easy retrieval of information. Let's say you need to make an index. Each word you want to list is keyed into the computer, which then displays every occurrence. It will continue until it reaches the end of a document. You can use global functions for correcting spelling errors, deleting redundant words, changing one vendor's name to another, etc.

Blocks

A block is any large amount of text. You define a block by putting block markers around the area with which you wish to work. The entire block can then be moved, changed or deleted at will.

For example, you need to change the position of a paragraph. You would like it better if it were at the beginning of the document, so you put markers around the paragraph, tell the computer where you want the block to be moved and give the command. Some programs refer to this feature by names such as "cut and paste," but its convenience is the same no matter what the name.

Merging

Merging has nothing to do with big business or Wall Street. It is a highly useful feature that enables the operator to create items such as personally addressed form letters in a minimum amount of time.

A typical merge feature works this way: you type out the basic letter, inserting "variable" commands in each place where names, account numbers, dates and so forth will change from letter to letter.

You then prepare a separate file of everyone's name and all the required information. Merging channels each name, account number, and date into the proper variable space.

Of course, you can also perform the same function by changing each letter manually, but merging takes only a fraction of the time.

Glossary

If you have names, sentences or paragraphs that you must write many times within the text, the glossary function will save you from entering the information each time.

You begin by making a glossary file—writing out the word(s) that you will be using often. When you prepare the document, you will now be able to refer to the glossary file, tell the computer which word(s) you want inserted, and it will do the rest. You can insert entire paragraphs with only two or three keystrokes.

Dictionary

Dictionaries, or spelling checkers, have up to 50,000-word memories (some allow you to add as many as 10,000 words of your own) that will let you know if you have made a typo or spelling mistake. If a word is misspelled, it will alert you by highlighting it, putting it in reverse video, etc.

Chaining

When you load new text material into the computer from your floppy disk, the computer automatically erases what was previously on the screen. However, by using the chain or assemble feature, you can "stack" one document on top of another. This comes in handy when you want to write material in small pieces, then combine them for a single print-out.

Directories and Menus

As you record each document on the floppy disk, you give it a name that allows you to retrieve it quickly. A directory or menu allows you to see the titles of all the documents you have saved. Some programs will let you break from your writing, look at the directory, then continue with the writing. With others you must exit the program thereby erasing any text you have not saved.

Merging has nothing to do with big business or Wall Street.

Embedded Commands

You can instruct the computer to change the printing format while printing. This way, you can include commands for centering text, justification, indentation, etc. within the document. The printer will go through the text, changing the format as it goes without stopping for readjustment. The embedded commands will not print out unless you want them to.

Headers and Footers

At times, you may need to include the document name on each page of the manuscript. This can be done with the header and footer functions. You can instruct the computer to print out the same information on every page—either the top for a header; or the bottom for a footer. You can also specify that this function occur only on odd or even pages. This is handy when preparing a manuscript that will be printed on both sides of the paper.

Also, the program may give you the option of selecting specific pages where the header and footer are to be placed (for instance, starting on page 2, all pages thereafter except 14, 18 and 23).

Pagination

It is difficult to know where one page ends and another begins when writing with a word processor, so trying to add page numbers in the text while writing can be next to impossible. Many programs, however, will put the page numbers on for you. You can begin numbering at any point, and place the number in any position you wish.

Hyphenation

Because of the wrap-around feature of a word processor, some lines may look peculiar. A word that doesn't fit will slide to the next line, and when printed, can look awkward. Most programs will allow you to hyphenate. The computer will tell you the words that will be affected, and you tell it if you want to hyphenate and where you want to break the word.

Print Modes

If you are printing on a long roll of paper, you can instruct the computer to print continuously. If you are using single sheets, such as letterhead, you will need to instruct the computer to stop after each page so you can insert a new sheet.

Documentation and Instructions

Don't overlook this important item when choosing software. Tutorial devices, such as audio cassettes or special learning programs, help the non-computer-trained operator to understand the system better. Many word processing programs are geared for someone with little or no computer knowledge, so the instructions must be explicit and easy to understand.

A helpful sales team is also an important adjunct to your software. They may be perfectly happy to sell you the computer and the program, but will they be equally helpful when you have a question or a problem?

Miscellany

Invisible lines, sometimes called comment lines, are used by authors for reminders, notes and remarks. Invisible lines show up on the video screen and will only be printed if you specifically ask for them.

Decimal alignment neatly places each figure in a column with all decimals aligned—especially useful when preparing bills and monthly reports.

Some programs are also capable of math functions. Enter the numbers, instruct the computer to perform the arithmetic and the total will appear where you have specified.

Underlining and boldface are especially useful for emphasizing certain words or phrases. Your printer must be able to perform these functions, which usually require it to back space.

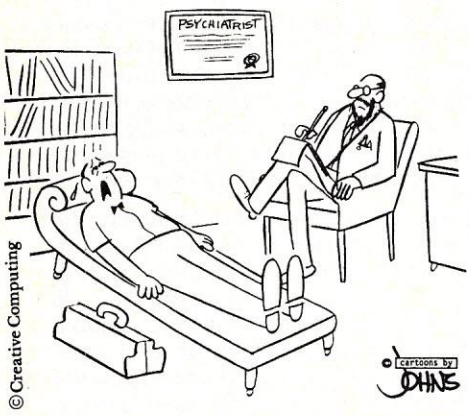
Subscript and superscript will shift the printing platen half a space up and down for printing scientific notation, equations, formulae and footnotes.

Where Do You Go From Here?

If you are considering the purchase of word processing software, you should now make a list of the features your processor must have to do the work you want done. Include the reasons for choosing certain capabilities and estimate the percentage of time you feel you will use each function. List the features you would like to have, but which are not absolutely necessary to carry out your work. Some capabilities, such as merging, math and dictionaries, are available as add-ons. If you find later that you need a feature not originally included with the program, you may be able to buy it separately.

After you have listed your feature priorities, talk with a computer and software representative to see what they have to offer you. By the way, many word processing programs are available through the mail. It is often cheaper and very convenient to buy this way, but *never* buy a program without trying it out first. Most software suppliers, understandably, don't have return policies; once you buy it, it's yours. So don't get stuck with something that won't work for you.

To some, word processing seems like a luxurious fad. People have been banging out letters and other documents on typewriters for almost 100 years, why not continue for a 100 more? But just try a good word processing program and I'll guarantee you will wonder how you ever got along without it! □



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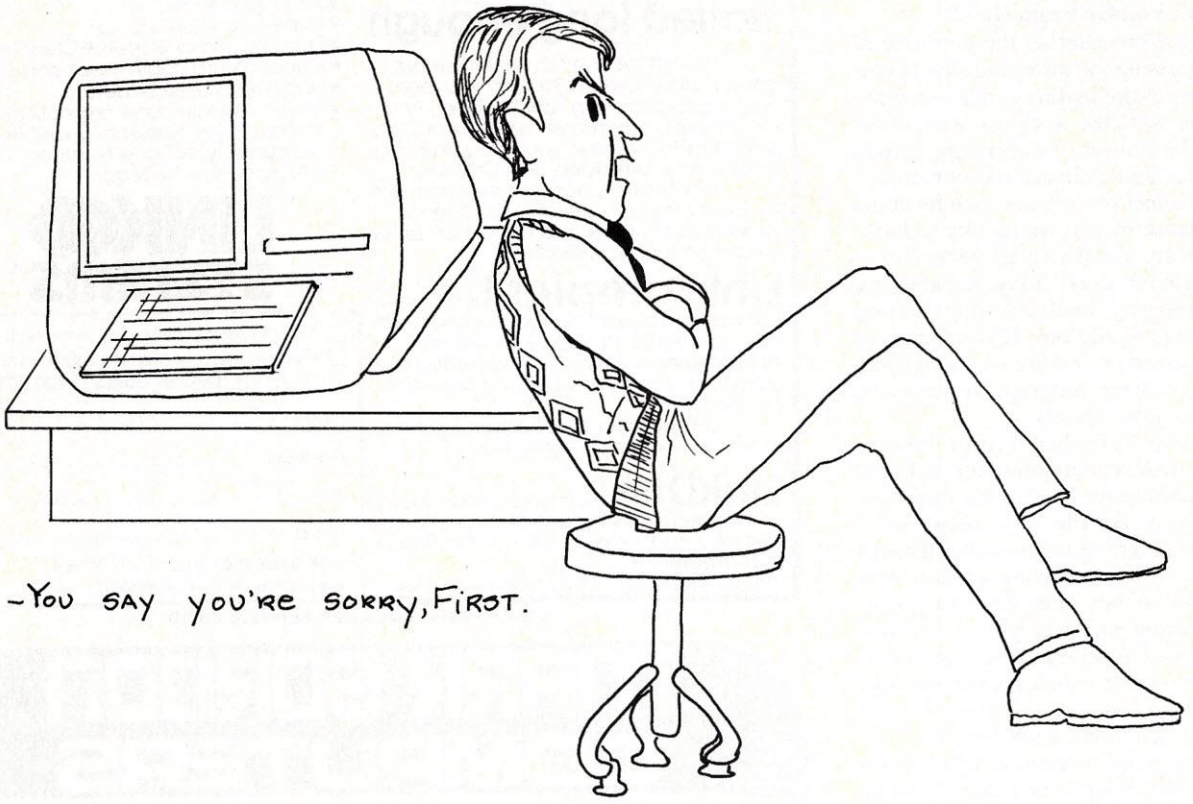
CIRCLE 165 ON READER SERVICE CARD

DEBUG/FURI

Carl Whitney



A new debugging language has reportedly been developed by Quzz Systems of Silicon Junction, California. The language is apparently designed expressly for microcomputers and is to be called "DEBUG/FURI" (Dual-Entry Binary-Uncoupled Generator and Formatted Universal Responder-I). While no formal announcement has been made by Quzz, several copies of the DEBUG/FURI manual have been circulating, reportedly after having been smuggled out of the company's offices by competitors posing as plumbing inspectors.

DEBUG/FURI appears unique in its ability to diagnose and correct both hardware and software errors, yet subtle enough to capture a range of meanings heretofore foreign to computer languages. Three of the language's commands are particularly worthy of note. The first is a statement of the PEST class (Preliminary Error Search and Terminate) — the user's first line of attack on hardware failure. The remarkable range of DEBUG/FURI's power is illustrated by the fact that PEST statements are employed in a great variety of situations, from a tape that refuses to load, to a machine that unexpectedly begins to display quotations from "Hamlet." The command is:

WHAT THE #*!(.& IS THE MATTER WITH YOU,
YOU +?/%$$*?

At one point in the manual, "#*!).&" is used instead of "#*!(.&", but this is probably a typographical error.

Inadequate program documentation, faulty logic, and a host of other programmer errors are addressed by the following statement:

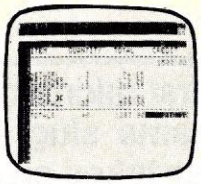
I'D LIKE TO GET MY HANDS ON THE
SON-OF-A-+!,&$$: THAT WROTE THIS

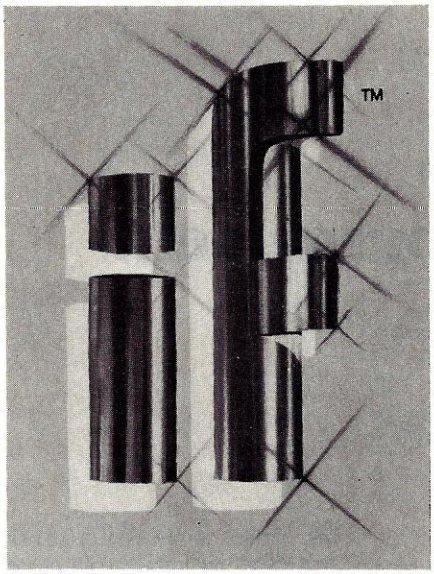
But the most powerful command within the language, and the only command in the highest error-correction mode, DESPERATION (Dynamic Error-Sensing Procedures and External Recovery Algorithm/Task-Implemented Origin Node) is not even keyboard-entered. The manual clearly states that the effectiveness of this instruction is not sensor-dependent, appearances to the contrary. Here is the algorithm for implementing DESPERATION, as presented by the Quzz manual:

> If all debugging efforts have proved fruitless, the programmer or user should remove his right shoe and begin tapping on any conveniently exposed part of the machine with a force of approximately 25 grams/cm^2. If the failure mode persists, force should be gradually increased to Level 10, or about 100 kg/cm^2. A jackhammer may be required to supply the necessary thrust. Care should be taken not to damage fragile components.

The micro world eagerly awaits DEBUG/FURI's formal debut. □

THERE IS MORE THAN ONE WAY TO PLAY "WHAT IF"





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These utilities enable the user to examine data both in the Apple's memory and on disks. Simple commands allow scanning through RAM and ROM memory as well as reading, displaying and changing data on disk.

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The **INSPECTOR** even lets you search through an entire disk or through on-board memory for the appearance of a string. Now you can easily add lower case to your programs (with LCA).

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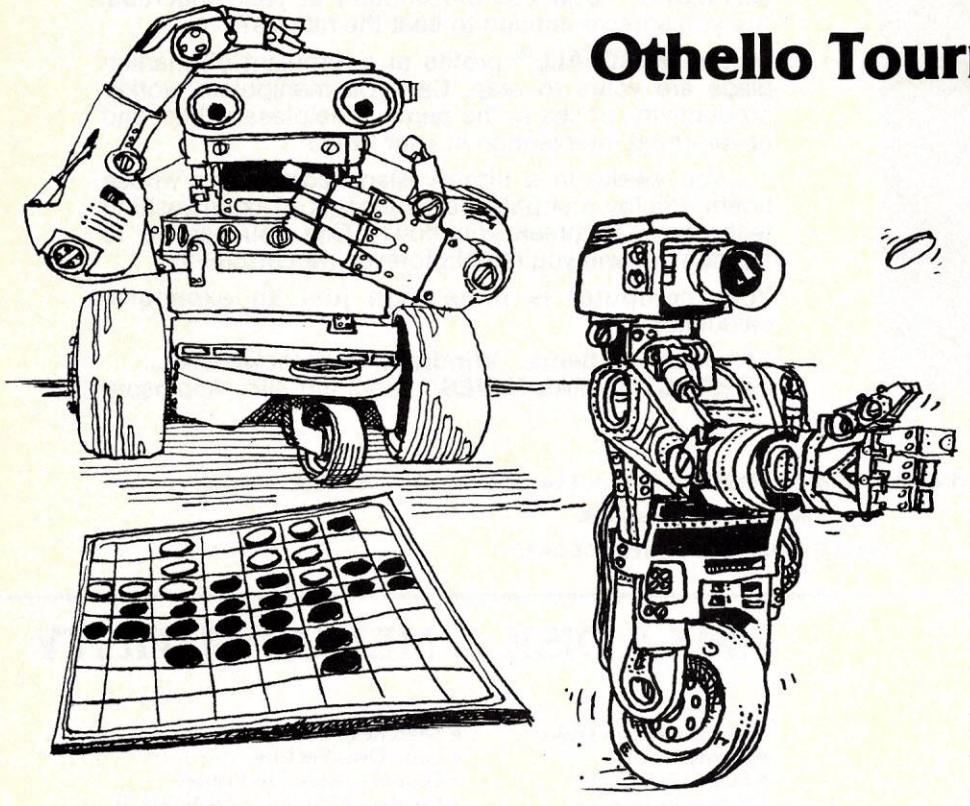
CIRCLE 241 ON READER SERVICE CARD

BDU1

The first microcomputer Othello tournament. Four programs slug it out with each other and the winner takes on a human. The results? Read on...

Othello Tournament



Stephen Kimmel

"Othello" is the most recent board game to make a reasonable claim to being a classic. On my "classic" games list I include Chess, Checkers, Go, Backgammon, and on even numbered days Parchesi, while on odd number days I include Monopoly. In fact, Othello is merely the latest reincarnation of an old board game brought to us this time around by Gabriel Industries, Inc.

The History of Othello

Just how old the game is, no one is really sure. According to "How to win at Othello: The Official Guide," Othello was invented and perfected by Goro Hasegawa in Tokyo, Japan long ago in 1971. Incidentally, Mr. Hasegawa is also the author of the book. Other than the name, Othello is identical to Reversi which appeared in London in the late 1880's. At the time, Lewis Waterman and John W. Mollett both claimed to be the sole and original inventors of the game. Both published offical handbooks and both authorized firms to manufacture the "original" version of the game. It may be that Lewis Waterman has the better claim having published first in a series of articles in *The Queen* a magazine of the times specializing in "affairs of interest to ladies." Regardless of which Englishman invented the game, Reversi was as enormously popular in England as Othello was in Japan.

Actually we have no reason to believe that any of these people invented the game despite their claims. "Games of Many Nations" claims that the game originated in China and was originally called "Fan Mien."

Stephen Kimmel, 4756 S. Irvington Place, Tulsa, OK 74135.

The Game

Othello is played by two players using an 8 x 8 board and 64 pieces that are different on the two sides. Normally the pieces are black and white although any pair of colors will do. In computer programs X's and O's are invariably used. The game begins from a standardized position with two X's and two O's forming a cross in the center of the board. It has only one rule. You must place your piece such that at least one piece of the opponent's color is between your new piece and another one of your color. This is called flanking and any flanked piece is reversed to show your color. At the end the player with the most pieces showing his color wins.

Simple? Deceptively so. Behind that innocent facade lurk some not-so-obvious features, a subtle strategy and a fine, challenging game. First, consider some of the dynamics. A piece in the center of the playing field can be captured along any one of eight directions. A piece on the edge can only be flanked by pieces also on the edge. A piece in a corner can never be captured. Thus the corner spots are the most valuable and the positions likely to lose corners are the spots to be avoided at all costs. Figure 1 shows the relative values of the squares.

500	-70	50	40	40	50	-70	500
-70	-200	20	20	20	20	-200	-70
50	20	20	0	0	20	20	50
40	20	0	●	○	0	20	40
40	20	0	○	●	0	20	40
50	20	20	0	0	20	20	50
-70	-200	20	20	20	20	-200	-70
500	-70	50	40	40	50	-70	500

Figure 1. Basic Stategy of Othello. Chart showing the relative values of the squares.

Of course, nothing is ever this simple. There are cases when a -70 square is worth a great deal more than a 50 square. These cases tend to deal with taking over the edge and keeping your opponent off the edge.

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Board Games

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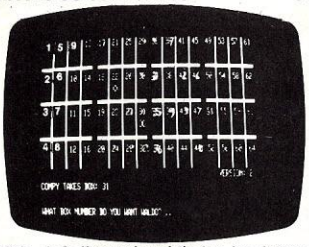

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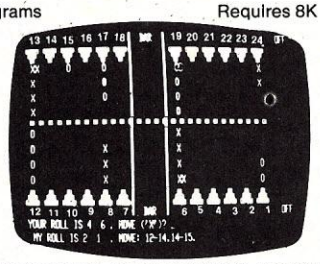
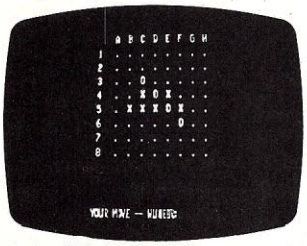


Backgammon. (by Scott Adams). Excellent graphics and challenging play in this popular game.



Flip Disc. Our version of Othello with three skill levels from good to expert.

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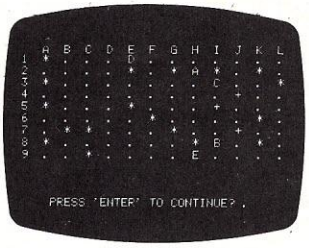

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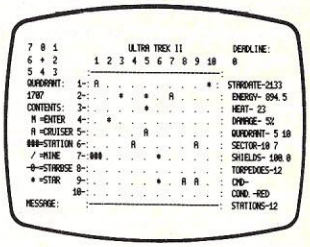

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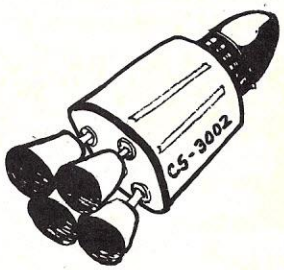

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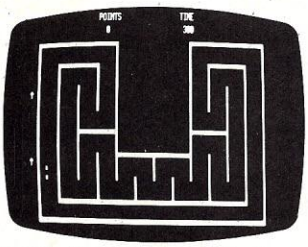

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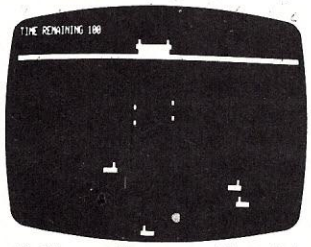
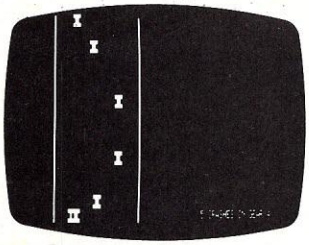


Depth Charge. Move your ship and drop charges to destroy as many subs as possible.



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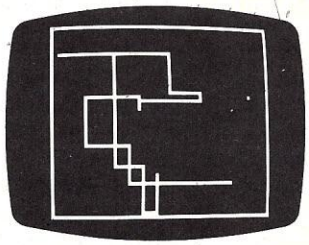
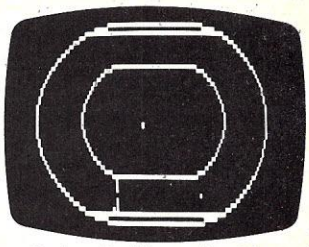


Evasion. Try to escape from the snake. It's not easy.



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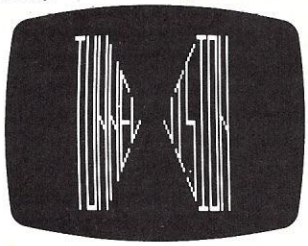

Tunnel Vision. Find your way out of a maze given only a mouse-eye view.

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CIRCLE 300 ON READER SERVICE CARD

Othello, continued...

Even more subtle is the need to keep a relative balance between your pieces and your opponent's pieces during the early portions of the game. The theory here is that both too many pieces and too few restrict your ability to move and to obtain advantageous postions. Figure 2 illustrates the problem of having too many pieces. In this case, 0 has won the game despite ●'s overwhelming lead.

There is a slight advantage to playing first. Some mathematicians believe, although to my knowledge it has never been proven, that the first player can always win if he plays the correct strategy. Thus, matches are always played in pairs with both players going first one game.

Now, if you choose to ignore these facts and basic theory, your strategy might well be simply to capture as many pieces as possible on each move. And you would look like a reasonable player for a while. You would also lose consistently to a good Othello player. Also, obviously, this is the simplest approach to programming a computer to play Othello. You have the machine test moves for legality and select the one with the highest number of captures. I hope it is clear that doing this shows a fundamental lack of understanding of the game.

Both too many pieces and too few restrict your ability to move and to obtain advantageous postions.

The Tournament

For this tournament I had four programs and one human. I like to use humans since they are the true test of a program. After all, programs are meant to play humans, not other programs. My human is, in my experience, a terrific Othello player and routinely practices at holding his opponents scoreless. However, the only human my human has ever played is me. Not real solid credentials, I will admit.

Flip Disc is one of a group of programs in the Sensational Software line. It comes on the tape with Mugwump, Wumpus, Wumpus 2, Qubic and Scott Adams' Backgammon. All of this for just $11.95. Typical of the software from Creative the program has detailed instructions of how the game works, far more detailed than the instructions I gave with this article. It is easy to work with and in the final analysis plays a pretty good game of Othello at its best level. At its lowest level, the program will only interest the beginner and is meant to be used by individuals learning the game and those who can't stand the idea of losing to a computer.

Othello is a program from Instant Software and a program from Mad Hatter software. I wish that I could tell you that Mad Hatter is still in business. I can't. I haven't seen one of their ads in eons and for all I know Tim Quinlan has dropped off the face of the earth.

Instant Software, however, is still very much in business. You can order their program for $9.95 (there are no other programs on either cassette). The Mad Hatter program at its best level only counts the number of pieces captured (I think. I haven't studied the internals of the program in great depth and detail but that's the way it acts), and as you would expect, doesn't play much of a game.

The I.S. program, on the other hand, uses a unique approach to the game. It uses a full width search to evaluate all of its possible moves, all of your possible responses, then all of its possible responses, etc. etc. until it reaches the level of difficulty you give it. To accomplish this in a reasonable amount of time, it is written in machine language. Despite this speed advantage, the higher levels are still too slow. I don't know how long it takes to make a move at level 6; I couldn't wait long enough. As with most Instant Software, the program has tons of options and lots of ways to forget how to do things. I was constantly dependent on the instruction sheet.

Finally we have Othello V by Peter Frey. Don't ask me what happened to Othello I through IV. I assume those are the ones that didn't make it. Nevertheless, this program did make it and for $10 it comes with a Lunar Lander program on the flip side of the cassette. It is a Basic program and is fairly simple to use. It has an end game strategy that sometimes makes the program take a long time to decide its last few moves—it may well be doing a full width search. You can order one from Professor Peter Frey, 421 Kerr Hall, University of California, Santa Cruz, CA, 95064.

Shall we begin then with the obvious? From the preliminaries we would expect the Mad Hatter program to be the weakest. We would also expect that the Instant Software Othello would be the strongest with the others somewhere in between. I chose to begin with the Mad Hatter program. Randomly selecting an opponent, I came up with Flip Disc. The first game is shown in Figure 3. I don't really recommend working through it unless you are the sort to get your chuckles by watching automobile accidents.

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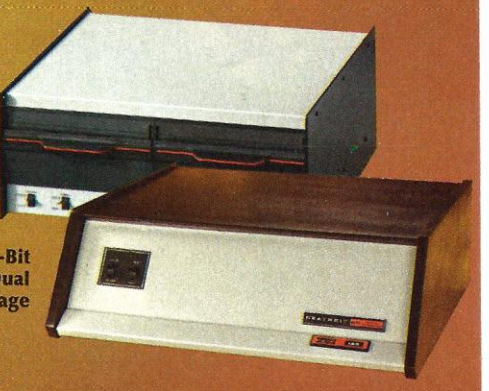

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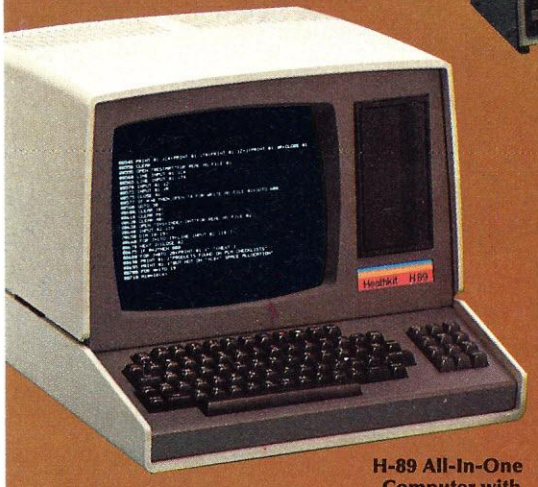

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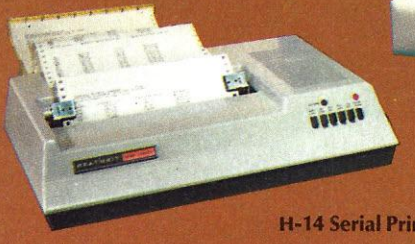

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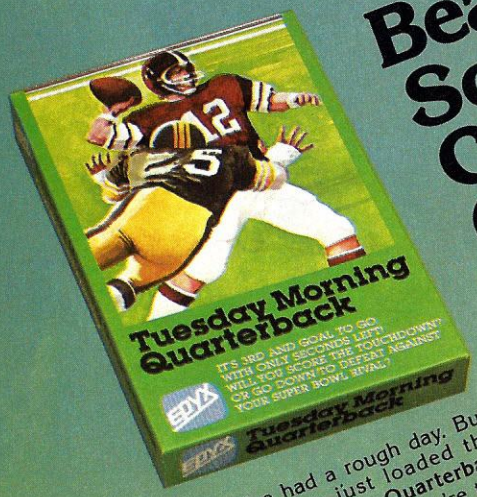
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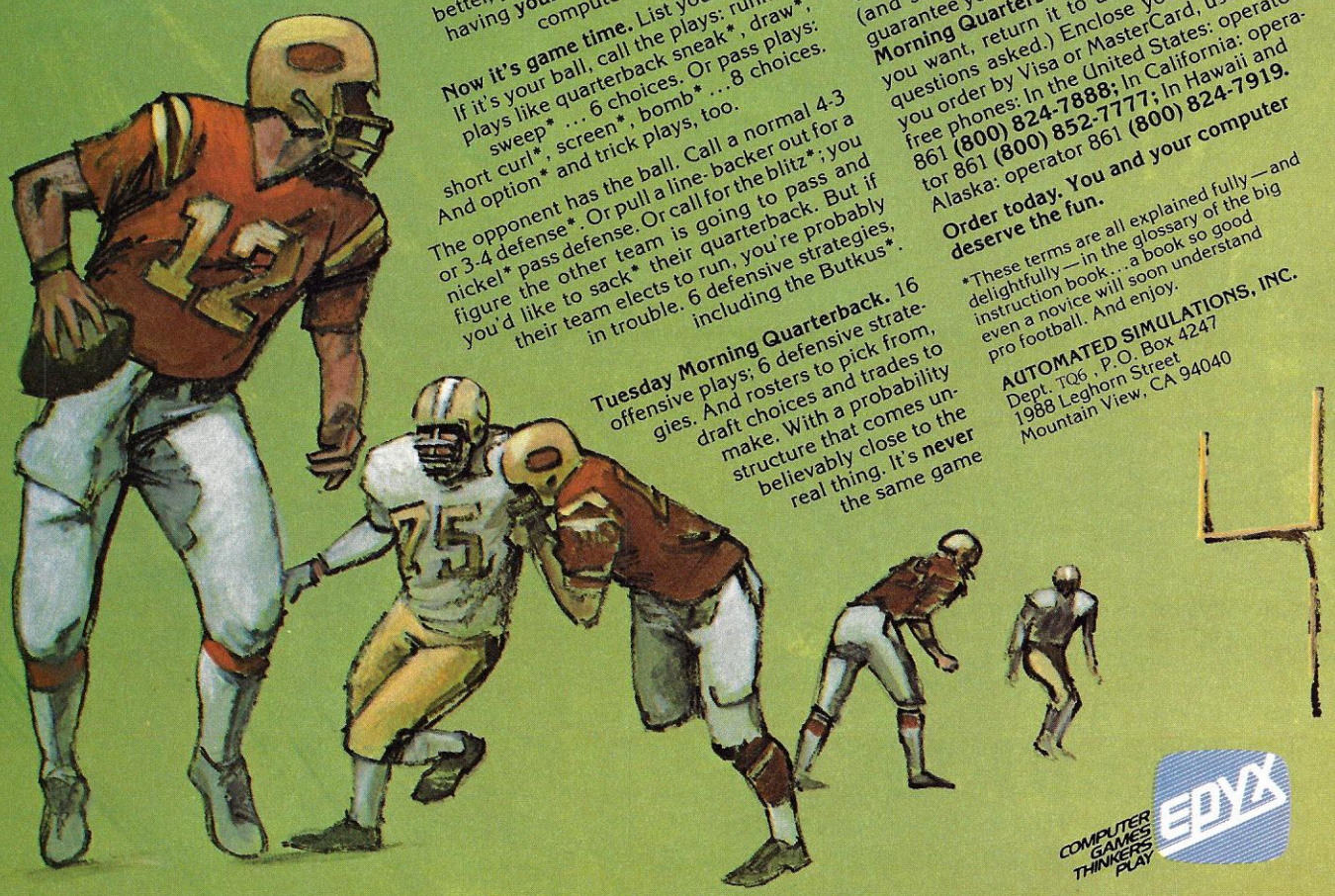

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It is clear very early in the game that Mad Hatter is simply interested in pieces, and has no understanding of corners, edges or Othello. So it comes as no big surprise that the program lost badly to every other player in the tournament. To be perfectly honest, Flip Disc at its lower levels plays the same basic strategy.

Next I played Flip Disc against Othello V. With Flip Disc as white I got one of the most interesting games of the tournament. This game is shown in Figure 4. At first it appeared that Flip Disc was going to make short work of Othello V. But outnumbered badly, Othello V showed a great deal of sophistication and outmaneuvered Flip Disc. Finally, the game turned on a mistake by Othello V and the final score was 32-32. That's right, a tie. However, allowing for the advantage that Flip Disc had by going first, we expected that Othello V was the slightly stronger program. This proved to be correct when Othello V won the other match with a score of 41 to 22. As expected, Mad Hatter lost both games badly.

That brought me to the match between Othello V and the Instant Software Othello, which, to be perfectly honest, I expected to win rather easily. After all, I.S. Othello is a machine language program capable of seeing to great depth, able to perform functions far faster than mere Basic. I forgot, however, one of the fundamental rules of computer. A rotten machine language program is no match for a terrific Basic program.

The first game of the match is shown in Figure 5. Othello V again falls far behind in the early going. At the point of the first game board illustration it is down 19 to 5. Again at the mid-game it starts to make its move by forcing the Instant Software Othello to give it a corner. At this point, however, Instant Software does something very curious. Although it has other legal moves and although the game is not yet lost, it gives away the second corner by playing a terrible move. It's almost as though it were committing ritualized suicide. From there the game is without excitement as Instant Software collapses completely. Indeed, the final margin of 48 to 16 was the largest of the entire tournament. The second game was much the same with Instant Software's Othello making the potential corner-losing move on its sixth move. The final tally was 24 to 40.

Keeping in mind the fact that Flip Disc managed a tie with Othello V but that I.S. Othello had been beaten twice, I decided it was time to match Flip Disc against I.S. Othello. The first game, shown in Figure 6, isn't really indicative of the relative strengths of the programs. Flip Disc made a subtle error early that resulted in the shortest game of the tournament. You may want to test your Othello skills by deciding where the crucial error occurred and why. Nevertheless, fair is fair, and I.S. Othello won the game. The second game turned out differently with Flip Disc winning 39 to 25.

High Noon for Othello V

Enter my human player into the tournament. My human, a snarling unshaved fellow wearing jeans dirty with miles of trail, tossed aside his black hat and sat down to smash the computerized efforts at Othello.

"Play Othello programs? Sho Pardner. Ah eat Othello programs for breakfast! Heh heh."

He humilated the Mad Hatter Othello and destroyed Flip Disk. The Instant Software program committed suicide again. Twice. Ah but it was fun. Only the sheriff, Othello V, remained to save the town from complete destruction.

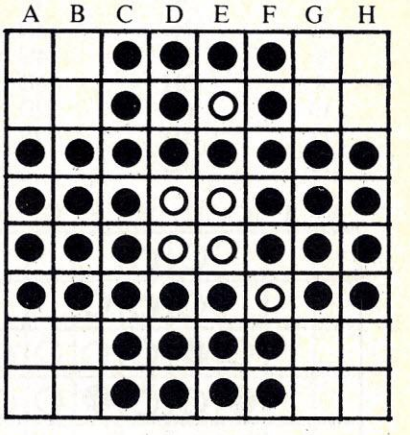
The gunfight had an eerily familiar look to it. Othello V had hardly any pieces. The human had successfully kept the program off all edges and had an overwhelming numerical lead. He was laughing and berating me for not coming up with any better Othello playing programs. Yes, he was having a high old time playing these miserable TRS-80 programs and I knew he would soon start smashing the saloon. Then Othello V moved to one of the forbidden inner corners and he was ready to clean up. There was one small problem. There was nothing he could do. Figure 2 represents a slight modification of that game. In a few moves, the human had lost 37-27.

A rotten machine language program is no match for a terrific Basic program.

The human stared at the screen in disbelief and demanded an immediate rematch. I was happy to oblige. Playing with extreme caution, ever watchful for mistakes, he managed to beat the program, but only by 36 to 28. Othello V had won the match on tie-breaker points. The old town was saved. Microelectronic people came tumbling out of rain barrels, cheering their hero. Still the human could not believe what was happening. I watched for seven more games. The human lost every one of them. For all I know he is still playing and still losing.

Now it was clear to everyone that Othello V was the best program in the tournament. It may lack the depth of vision of I.S. Othello. It may lack the instructions and concurrent programs of Flip Disc (which make it the best bargain and my second choice). It definately lacks the comic relief of Mad Hatter. What it has are subtlety and an understanding of the game that impressed me greatly. I recommend it highly. □

Figure 2.



O is to move and win. Although ● has a numerical advantage, O is going to win overwhelmingly.

Figure 3.

	●Mad Hatter	OFlip Disc
1	5F	6F
2	4C	3C
3	7F	5C
4	5B	6C
5	3D	3F
6	7C	8C
7	7D	6A
8	5A	6E

(it becomes clear that the Mad Hatter program does not understand the value of the edge.)

9	3B	4A
10	3E	3A
11	2A	1A

(everyone realizes that the program doesn't understand the corners either.)

12	3G	3H
13	2C	1C
14	1B	1D
15	1E	1F
16	6B	4F
17	2F	8F
18	2H	1H
19	8D	6D
20	6G	6H
21	7E	8E
22	7H	8H
23	7A	8A

(all that remains is the slaughter of the innocents.)

Othello, continued...

24	1G	8B
25	4H	5H
26	7B	2D
27	4B	4G
28	5G	7G

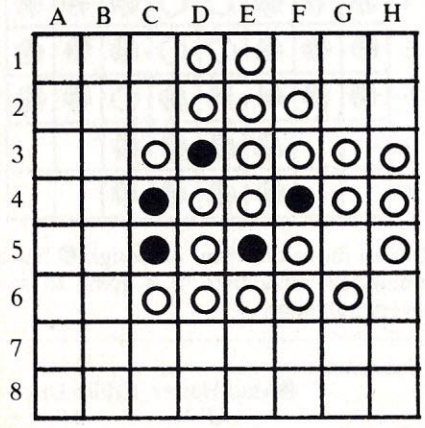
(Mad Hatter has no legal moves...)

29	8G	—
30	2B	—
31	2E	2G

FINAL SCORE 24 TO 40

Figure 4.

	○Flip Disc	●Othello V
1	6E	6F
2	5F	4F
3	3F	5C
4	6C	3D
5	3E	2F
6	3C	4C
7	3G	4H
8	3H	4G
9	5H	6D
10	6G	2D
11	1D	2E
12	1E	

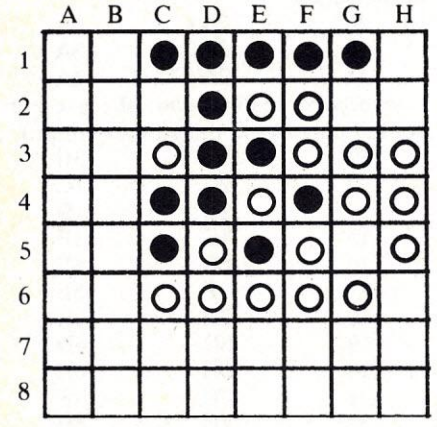


(Although the position may seem to be solidly in favor of Flip Disc at 22-5 it is all an illusion...)

12		1G
13	1F	

(A solid mistake by Flip Disc permitting Othello V to take over the top edge...)

13		1C



(Othello V's position is clearly solid and Flip Disc's numerical lead seems very much in danger...)

14	6B	2C
15	3B	4A
16	3A	4B
17	5A	7H
18	6H	

(Flip Disc's error shows the over-emphasis on edge pieces. This move gains an edge position only to lose it immediately...)

18		2H
19	2B	5G
20	5B	1B
21	2G	1H
22	—	7A
23	6A	1A

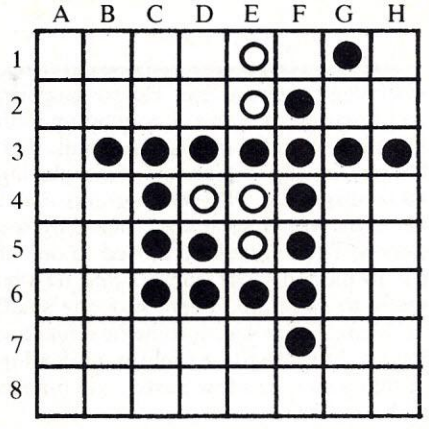
(A crucial error by Othello V since this permits Flip Disc to grab the other corner. Othello V never really regains the offensive again...)

24	8A	7B
25	2A	7F
26	8B	7E
27	8F	8D
28	8E	7D
29	8C	7C
30	7G	8G
31	8H	

FINAL SCORE= 32 TO 32

Figure 5.

	○Othello V	●Othello—Instant
1	D3	C5
2	F6	F3
3	D6	E6
4	F4	E3
5	C3	C6
6	F5	F7
7	G3	F2
8	E1	G1
9	E2	H3
10	C4	B3



This certainly appears to be a fairly solid position for ●...no horribly obvious flaws...On the other hand, O has no really vulnerable locations.

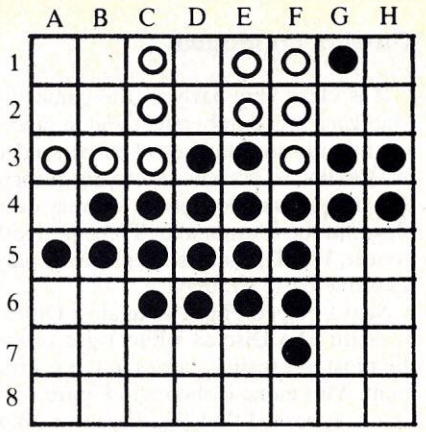
11	B5	C2
12	C1	A5
13	A3	B4

Note the action in the upper left corner...

14	G4	

There must be some reason for just taking one. Do you see it?

14		H4
15	F1	



Othello V needed the piece at F3 so it could move to F1. That move wins the corner. No matter what ● does, O's next move is to H1. The best ● can hope to do is take pieces. Unfortunately, he has few choices available for that.

15		G2
16	H1	A2

Here we see the Instant Software Othello's peculiar form of ritualized suicide. He just lost one corner. Now he's giving away the other...and probably sealing his doom.

17	A1	D1
18	H2	B1
19	H5	B2
20	A4	G5
21	A6	B6
22	A7	B7
23	A8	B8

Othello V finishes solidifying the edge by adding a third corner. Although still behind numerically, very little doubt remains...

24	C8	C7
25	D8	—

Othello V takes the lead for the first time and embarks on the 8 edge...

26	D7	E7
27	E8	F8
28	G8	G7
29	H8	H7
30	H6	G6
31	D2	

FINAL SCORE = 48 TO 16

Which is the most decisive edge of the tournament.

Figure 6.

Now the shortest game in the tournament. Flip Disc makes a crucial error early that results in an 8 move game. See if you can find the blunder.

	Flip Disc	Othello-Instant
1	D6	C4
2	F3	F6
3	E6	C6
4	C3	F4
5	F5	F2
6	C5	C2

This game's really over now so the blunder must be somewhere before here.

7	E3	E2
8	D3	D2

FINAL SCORE 0 to 20 □

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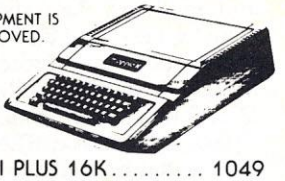

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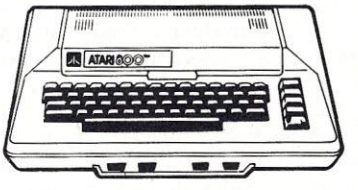

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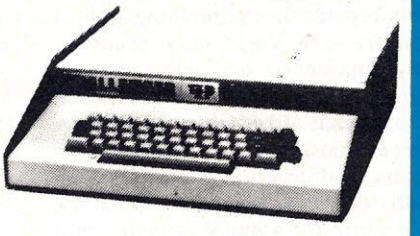

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6th COMPUTER FAIRE

Conference & Exposition On
Intelligent Machines for Home, Business & Industry

SAN FRANCISCO CIVIC CENTER APRIL 3-5, 1981

David H. Ahl

Every year it gets better. With scores of new computer shows springing up over the country (one single show promoter recently announced ten new computer shows), we get to think of all of them as being somewhat alike. Oh sure, they are in different cities, they have different show promoters, and different exhibitors—but generally the shows are pretty much the same. It's rare for a major manufacturer to introduce a new product at one of the personal computer shows. Generally new products are rolled out at the National Computer Conference or at the Consumer Electronics Show or in a manufacturer-sponsored press conference.

On the other hand we've always enjoyed the West Coast Computer Faire. *Creative Computing* has been an exhibitor at the Faire since the very first one started in 1976. We followed Jim Warren around with his abortive attempt to introduce a Faire to the Southern California contingent. We exhibited in San Jose in less-than-adequate quarters (understatement!) and we followed Jim back up to San Francisco to Brooks Hall. Well, this year Brooks Hall could barely hold the Faire. Booths were set up in every conceivable location after the two main exhibit halls were filled. There were booths in the hallways, booths outside the restrooms and almost inside the conference rooms. There were mini-booths, regular booths, maxi-booths, island booths and booths that Jim Warren terms "sub-continents."

The Faire had something for everyone. There were over 150 presentations on every subject from educational software to UCSD Pascal to LISP to Computing in Medicine. There were user-groups for every conceivable computer system. MITA (The Microcomputing Trade Association) had a meeting, of course. There were sessions for novices as well as sessions for people more advanced in computing. And *Creative Computing* gave out its first annual "Creativity in Programming Award" to Tim Smith, the creator of Olympic Decathalon marketed by MicroSoft.

Then there were the exhibitors. They too covered the range from one-man moonlighting companies to multi-million dollar corporations. There were new products to be seen, new software systems, new peripherals and new ideas. We can't begin to give you a complete idea of everything that was at the Faire in this short article. However, over the next few issues we will be bringing you a series of short reviews and articles, new products that were introduced, some intereviews with leading people in the industry, and mentions of new products in our "New Products" section.

In this article, however, I'll try to give you a flavor for some of the new computers, printers, peripherals, and software that were to be seen at the Faire. This is not my selection of "what's best;" it's just a sampling of the offerings at a random cross-section of booths.

Computers

Osborne Computer Corporation

As mentioned in the April issue, Adam Osborne introduced the Osborne I Personal Business Computer at the West Coast Faire. The Osborne I is a portable computer built around a Z80A CPU with 64K bytes of RAM, two floppy diskette drives with 100K bytes each of storage, a full-stroke keyboard with numeric keypad and cursor control keys, built-in CRT monitor, and interfaces for communication with printers and modems. The standard software includes the CP/M disk operating system, Word Star Word Processing with Mail Merge, SuperCalc "Electronic Spread Sheet" (a package similar to VisiCalc), CBasic and MBasic. The price, as of this writing, has escalated to $1795.

For more information, write Osborne Computer Corporation, 26500 Corporate Ave., Hayward, CA 94545 (415) 887-8080. More about the Osborne I and a complete review will appear in *Creative Computing* in, we hope, the September issue.

Micro-Expander Inc.

As long-time readers of *Creative Computing* know, the Sol computer manufactured by Processor Technology was one of the most reliable designs around. Unfortunately, it was somewhat expensive to produce and Processor Technology went out of business. Before going out of business they commissioned a new design from Lee Felsenstein (also the designer of the Osborne I) but unfortunately the new Sol was never produced. Now, a Swedish company has bought the design rights and is manufacturing the computer under the name "Expander."

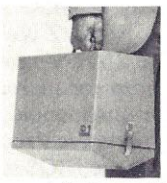
Only a small fraction of the booths can be seen in this photo.

IT WAS INEVITABLE

Sooner or later, someone had to take all this proven microcomputer hardware and software technology and wrap it up in a portable package at a price that shocks the industry. Adam Osborne decided to do it sooner.

The OSBORNE 1®, from Osborne Computer Corporation. You get full CP/M® disk computer capabilities—Z80A® CPU, 64K bytes of RAM memory, a full business keyboard, a built-in monitor, and two floppy drives with 100K bytes each of storage. You get two interfaces, the IEEE 488 and the RS-232C. Just connect a printer, via either interface.

Software? You get CP/M®, CBASIC-2®, Microsoft BASIC®, the WORDSTAR® word processing system with the MAILMERGE® mailing list feature, and the SUPERCALC® electronic spreadsheet package. All standard. All for $1795.



And it's *portable.* When the keyboard is clipped over the display panel, only the weatherproof plastic case is exposed. (There are even optional modem electronics, couplers, battery packs, and external monitor connections, providing practically unlimited system portability.)

It's all business. The OSBORNE 1 delivers *significant* productivity at an irresistable price. At $1795, it's immediate and lasting success as a personal business computer is, quite simply, inevitable.

$1795

OSBORNE
COMPUTER CORPORATION
26500 Corporate Avenue Hayward, California 94545 (415) 887-8080

Orders for the Osborne 1 Computer can be placed over the telephone at (415) 887-8080. Your order will be forwarded by the factory for delivery by your nearest authorized Osborne 1 dealer.

CIRCLE 249 ON READER SERVICE CARD

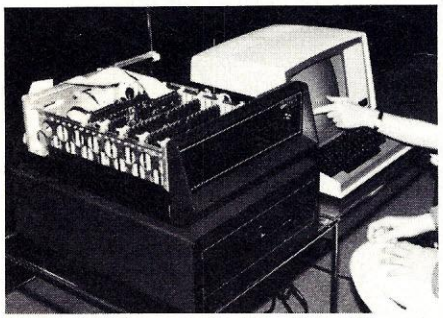
The Expander is built around a Z80A CPU with 64K bytes of RAM memory. It uses the S-100 bus and, like the original Sol, has four slots for add-on peripherals. It includes a real-time clock, serial port, parallel port, tone-generator, and five prioritized interrupts. A cassette tape interface, interestingly enough, is compatible with the TRS-80. It uses a black and white display, 24 x 80 characters and has both upper and lower case. Graphics resolution is 160 x 72 pixels, color graphics resolution is 80 x 72. It has 64 colors each available with four intensities for a total of 256 colors. All are simultaneously available. In color mode it can display 40 characters x 24 lines. The Expander uses a standard 80 key full-stroke keyboard with 62 alpha-numeric keys and 18 keys in the numeric keypad with cursor controls. It is CP/M software compatible and runs 24K MicroSoft Basic on disk or 10K MicroSoft Basic from cassette tape. Price of the system is $2200.

For more information, write Micro-Expander Inc., 6835 West Higgins Ave., Chicago, IL 60656. (312) 792-1196.

Ithaca Intersystems

Ithaca Intersystems announced "the fastest, most complete, S-100 software development system available today."

The system is designed and configured specifically for the systems developer. It is based around the Intersystems Z80 Pascal development system and includes the Pascal/Z compiler with Intersystems cache BIOS, which provides a system that delivers 2-4 times the speed of other floppy disk based CP/M systems.



Intersystems was showing a Pascal application development system based on their popular S100 bus computer. The Intersystems Development machine has an 8- or 16- bit bus, 20-slot motherboard and is expandable to 128K.

The Pascal/Z system generates reentrant Z80 object code, supports direct file access and variable length strings, generates relocatable object modules, and permits separate compilation. In other words Pascal/Z is a compiler and generates native Z80 code rather than P/code. This provides for increased execution speeds faster than could be obtained with an interpretative P/code implementation.

A cache BIOS is a system which essentially makes disk memory look like an extension of main memory of the CPU. Conventional disk systems read or write one sector at a time. The cache system reads the entire disk track and stores it in a track buffer in extended memory out of the way of the user's program area. Any time the user wants to access data on that track, the sector is copied from the track buffer into the user's area. This is much faster than getting the data from the disk one sector at a time.

The systems utility package includes five utilities designed with the systems programmer or sophisticated end user in mind. They include InterEdit, a screen oriented editor for entering documents and programs; Compare, which allows the user to quickly view all the differences between two files; Spell, a spelling checker and corrector with 10,000 word user-modifiable dictionary; Quick Copy, which allows the user to copy and verify an entire 8" diskette in under two minutes; and Help, which allows on-line access to documentation at both system and applications levels.

For more information, write Ithaca Intersystems Inc., 1650 Hanshaw Rd., Ithaca, NY 14850. (607) 257-0190.

TRS-80 Look-Alikes

Personal Microcomputer Corp. (PMC) was showing the PMC-80 computer, a TRS-80 look alike, although, we note with interest, that PMC states "the PMC-80 is not a copy of the TRS-80." Perhaps the reason they say that is because the unit is integrated into one attractive housing and furthermore a cassette recorder with volume control and level meter is built-in. PMC also offers several unique peripheral devices including "Fast Load," a high speed cassette drive that allows inputing programs at 16 times the usual TRS-80 speed. They also offer an S-100 bus expansion interface that allows users to add any of the many S-100 bus accessories to the PMC-80. Perhaps most significant, PMC offers the DLR-50 down loader which is designed for distributing programs from a master computer to a number of slave computers.

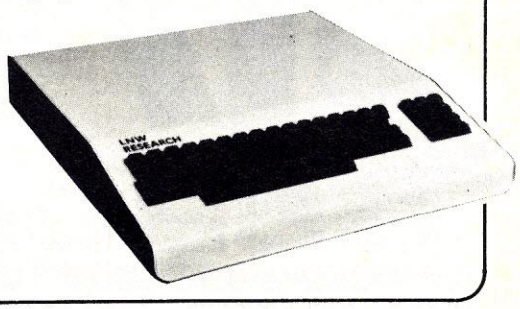
The down loader system is comprised of a master disk-based PMC-80 with 48K byte memory and a number of slave PMC-80s. The slave units are 16K byte units

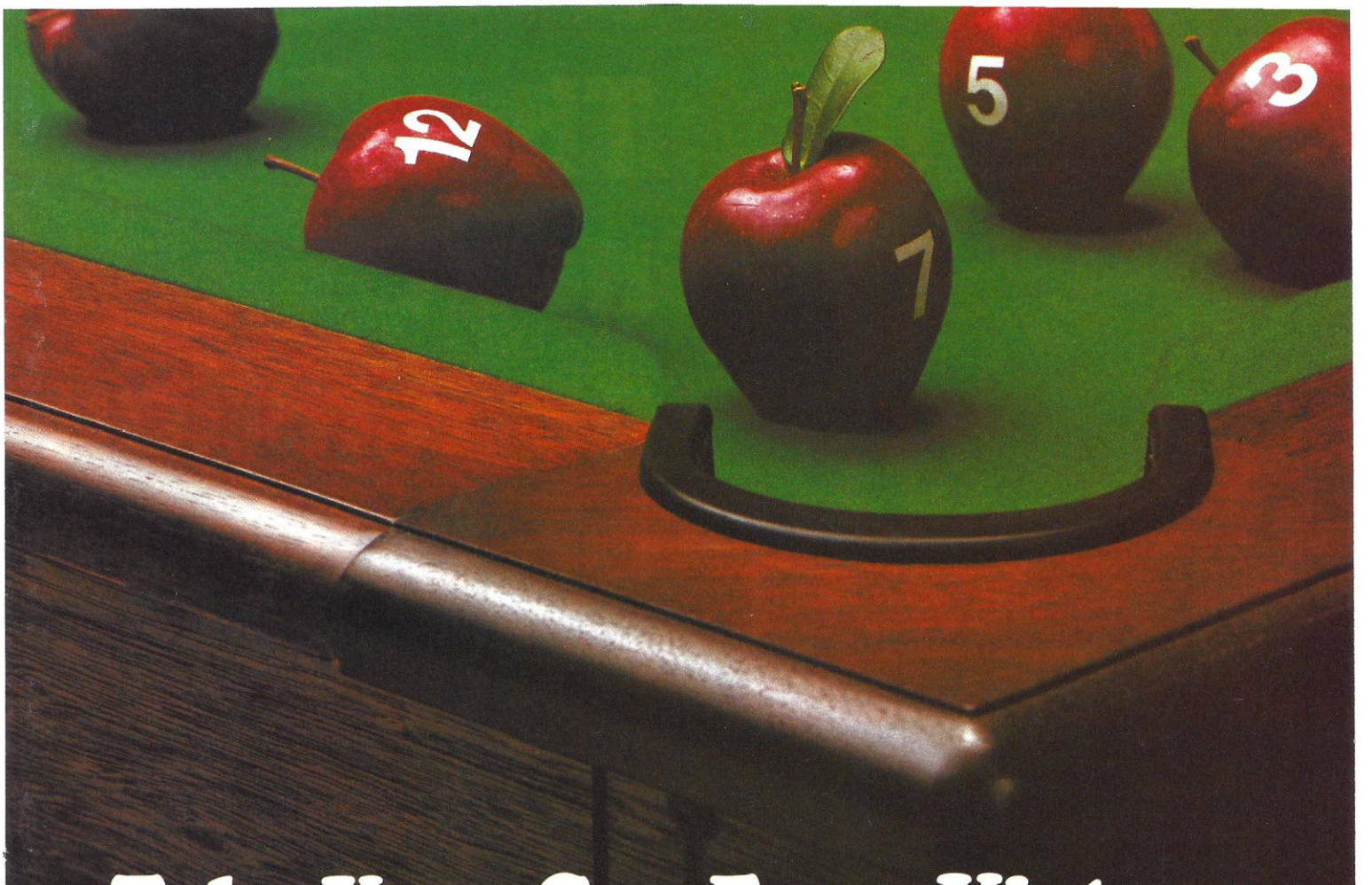
equipped with a fast-load modification which accepts data serially from the master at 10,000 bits per second. The master unit has a down loader interface (DLR-50) on an S-100 bus card which plugs into the expander chassis.

The down loader operating system is a disk-based system which permits the operator at the master unit to select a operator at the master unit to select a subset of programs and data for transmission to the slaves. The programs selected are repeated sequentially in the order specified until the operator intervenes. Between each program the menu of programs available to the slaves is transmitted. Operators at each slave select which program or information they desire to load from the menu of those available. Typing "Load" plus two additional keystrokes will then load the program into the slave the next time it is transmitted.

The PMC-80 master with 48K memory and two disk drives is priced at $3,000. Each slave with 16K memory is priced under $1,000. For more information, contact Personal Microcomputers Inc., 475 Ellis Street, Mountain View, CA 94043. (415) 962-0220.

LNW Research Corporation was also showing a TRS-80 compatible computer. They had a large comparison chart on the wall of their booth showing a feature-by-feature comparison with the TRS-80 Model 3, the PMC-80, and the LNW80. Principally, the LNW80 differs in that the processor works at 4 megahertz as opposed to 2 megahertz for TRS-80 and PMC-80. It also has a 24 x 80 character screen, upper and lower case, reverse video, an additional numeric keypad and high-resolution black and white graphics. The graphics resolution of the LNW80 is 480 x





Take Your Cue From Vista . . .

When it comes to Apples, take your cue from Vista's A800 Eight-Inch Floppy Disk Controller. The A800 offers a cost-efficient approach to software compatible disk memory expansion for your Apple II® computer. The A800 Controller enables Apple II users to access up to five megabytes of online storage through conventional disk operating (DOS) commands.

The Control and DMA Logic provides high speed (1 microsecond per byte) transfer of data from the disk drive directly to the Apple II memory without processor intervention. Plus, the Phase-Locked Loop Data Separator provides the ultimate in data reliability.

AND THERE'S MORE.

The controller is compatible with the most popular disk operating systems for the Apple II computer. It also interfaces to all Shugart/ANSI Standard Eight-Inch Floppy Disk Drives. The A800 provides complete IBM format compatibility in both single and double-density modes.

It's a Sure Shot.

THE HOT SHOT AT A COOL PRICE.

The A800 is reasonably priced at $595. A price you can't beat when you compare its quality and performance.

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Vista offers you a complete line of peripheral equipment to maximize the capabilities of your Apple system including: High capacity Mini-floppy Disk Drives, the Vista Music Machine 9 and the Vista Model 150 Type Ahead Buffer. In addition, Vista offers a line of advanced components fully compatible with the TRS-80* and S-100 based computers.

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Santa Ana, CA 92705
(714) 953-0523

Call Toll Free 800-854-8017

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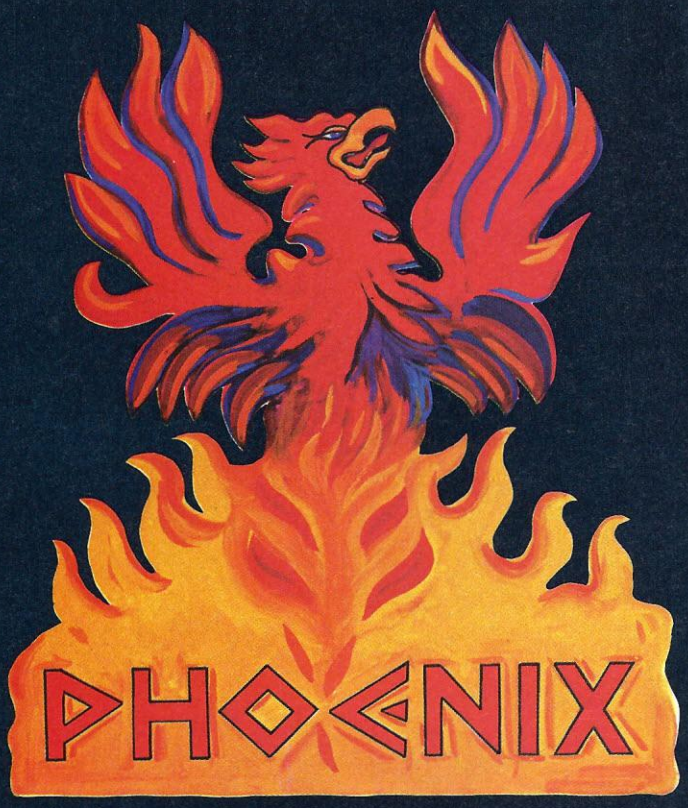

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We know word processing. A year-and-a-half ago the owners of *Designer Software*™ wrote a well-known word processor for another company. In the last 18 months we've learned about other features you want in a word processing package. *PHOENIX*™ Word Processing reflects our experience. It is more powerful and flexible than other word processing packages you can buy. And since we designed "human engineering" into *PHOENIX*™ Word Processing from the beginning, it can compete, feature for feature, with expensive dedicated word processors.

Many people have remarked that the user's manual we wrote earlier was the best ever for microcomputer software. Even so, we felt that we could have made it more accessible to the non-technical user. With *PHOENIX*™ Word Processing we have a separate Training Manual with beginning, intermediate and advanced levels. By allowing you to work at your own level, we have made the learning process easier and less intimidating.

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All five *PHOENIX*™ general accounting packages (General Ledger, Accounts Receivable and Payable, Payroll and Inventory) were designed by CPA's based on similar packages from mini and mainframe computers. The programs are COBOL with an integral assembly-language data base. They are fully integrated to allow automated posting to the General Ledger. An internal screen handler permits full-screen data entry for speed and ease of use. Although we made cosmetic enhancements prior to distribution, the basic programs have been user-tested for at least eighteen months.

PHOENIX™ Accounting also includes a growing number of specific application packages. We have completed or scheduled for completion Fixed Assets, Tenant Processing, Mail Management, Financial Projections and Time/Billing. Each package stands alone, but many also work in conjunction with other *PHOENIX*™ packages. For example, *PHOENIX*™ Mail Management will work very well by itself, but we also designed it to fit in easily with the merging capabilities of *PHOENIX*™ Word Processing.

With *PHOENIX*™ Accounting we have, as always, given special attention to documentation. Not being content to describe which buttons to push, we have taken the time to explain the accounting principles behind the programs and how each package fits into an automated office. To this end we created the fictional town of Smallville with a fictional company, Moustache Manufacturing. By seeing how Mr. Small and his employees use *PHOENIX*™ Accounting at 2M, you learn to apply it to your office as well. The Smallville sections are amusing as well as informative, and you will likely read the manual just to find out what Sidney, Mr. Small's incompetent brother-in-law, will do next.

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CIRCLE 150 ON READER SERVICE CARD

192 pixels and it also has color graphics with a resolution of 128 x 192 pixels in eight colors. Base price of the LNW80 is $1200. With black and white monitor and one 5" disk drive the price is $1664 compared to $1840 for the PMC-80 and $2187 for the TRS-80 Model 3.

LNW was also showing a system expansion interface for the TRS-80 consisting of a printed circuit board and user manual. The interface provided serial RS232 I/O, floppy disk controller, 32K bytes of memory, parallel printer port, dual cassette port, real-time clock, and a screen printer bus. Price is $69.95.

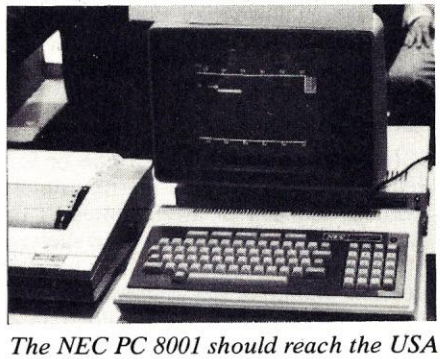
For more information, write LNW Research, PO Box 16216, Irvine, CA 92713. (714) 544-5744.

More from Japan

The 10 x 10 booth of the Japan Microcomputer Club probably had more information per square foot than any other in the Faire. They were showing four new Japanese computers at the booth. All have been mentioned before in *Creative Computing* in writeups of the Consumer Electronics Shows and Personal Computer World Show, however, a brief additional mention is in order. Probably the most interesting of the group is the **BMC IF800** computer. It was previously mentioned that Oki was manufacturing this unit, however, in the United States it will be known as the BMC computer. This Z80A-based unit has a very high resolution (640 x 200 pixels) color graphics screen, dual floppy disks built-in, function keys, a dot-matrix printer, built-in full-stroke keyboard with numeric keypad and cursor pad, and a host of other features. The estimated US price of this unit seems to be rapidly rising and is now hovering around $9000.

The BMC IF800 will cost around $9000.

For more information, write BMC USA Inc., Suite 600, Union Bank Building, 11222 La Cienega Blvd., Inglewood, CA 90304. (213) 641-4588.



The NEC PC 8001 should reach the USA shortly.

The Club was also showing a **NEC PC-8001** computer. This will probably be the first one of the true Japanese computers to reach these shores. It uses NEC's own CPU, although it is Z80A compatible. It includes 16K bytes of RAM expandable to 32K bytes, has a color CRT with 160 x 100 pixel resolution in eight colors. Also available is reverse, blink and a "Secret" mode. It has several different screen character sizes ranging from 80 characters x 25 lines to 36 characters x 20 lines. The unit has a full-stroke keyboard with numeric keypad and five function keys. The Basic is "almost standard" MicroSoft Basic with several powerful graphic extensions and the programmable function keys which can be used for, let's say, loading a program into RAM from floppy disk by simply pressing one key. Each key can stand for any basic statement or command or subprogram. US price of the unit has not yet been determined. For more information, write NEC America Inc., 1401 W. Estes, Elk Grove Village, IL 60007. (312) 228-5900.

The Sharp MX-80B is a popular unit in England.

The **Sharp MZ-80B** Personal Computer is a nice little unit, however it is unlikely that it will be introduced in the United States as it has been on sale in Great Britain for over a year and shows no signs of reaching these shores. It has similar capabilites to the TRS-80 Model 1, although it has improved graphics resolution and is more attractively packaged.

The Hitachi MB-6890 is priced at an attractive $1500.

The Hitachi MB-6890 is based on a 6809 mpu and, like the BMC unit, has very high resolution (640 x 200 pixels), although not in color. It has 32K, five function keys, numeric/cursor keypad and optional disk. Price starts at roughly $1500.

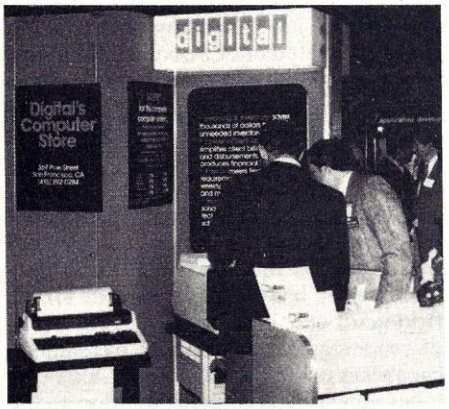
Micro Cosmos

This unit was not being shown at the show, however, we did have an opportunity to see one close-up. At the moment it is in only prototype stage but provides full terminal capability in a unit measuring only 7" x 3-1/2"x 1" with a bright moving LED display. It has automatic dialing, built-in modem, and is designed to hook into information networks such as Source and MicroNet.

Some of the new hardware from Heathkit, in particular, a new 8" floppy disk which runs under the CP/M operating system. Heathkit, in response to criticism from users as well as second source software vendors, has standardized their software offerings and now offer Microsoft Basic, Fortran, Cobol, and of course, CP/M from Digital Research, The Peachtree Business software from Retail Sciences, Inc., and several packages from MicroPro including WordStar, WordMaster and SuperSort.

The real mark of the creative person is that the unforeseen problem is a joy and not a curse.—Norman H. Mackworth

Printers & Plotters



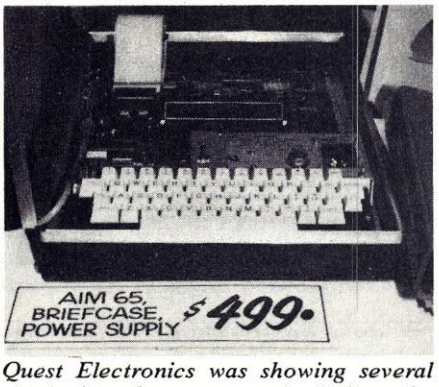
The booth of Digital Equipment Corporation announcing the opening of their new computer store in San Francisco, as well as a $5000 mini[micro system.

Digital Equipment Corporation

DEC's San Francisco computer store was showing several small business and word processing products. Notable was the WS78 Word/Data Processing system, which is complete with a video display, keyboard and keypad, dual diskette drives, and printer. Prices start at $4995 exclusive of software. Software packages available for the system include Word Processing, Accounts Receivable, Accounts Payable, General Ledger, Payroll, Inventory/ Invoicing, and Financial Modelling. All of the software packages operate under the OS/8 operating system meaning, of course, that imbedded in the WS78 is a PDP-8 computer.

Digital also has two specialized application software packages: The Construction Management System, which is designed to control job costs and track profitability of construction contractors, and a Dental Management System, which is designed to improve dental practice management and lighten the administrative workload of dental offices.

DEC products are available through any one of the nationwide chain of 25 retail stores.



Quest Electronics was showing several single board computers including the AIM65 in a briefcase with a power supply and miniprinter all for $499.

Omnico

Omnico was showing a rather unique peripheral, the OmniColor Printer for the Apple. The printer was originally designed to run on the CompuColor Computer and was also being shown at the CompuColor booth. However, the version of interest to perhaps more people is that for the Apple. The printer hardware includes an interface card, cable and color inkjet printer with a 16 or 32K buffer. The software is written for DOS Version 3.3 and includes a screen dump package for high-resolution page 1 or 2 which permits either page to be printed consecutively horizontally or vertically as one page. Software also permits printing of any portion of memory, complementary black and white and continuous copies while it is off-line. The printing speed is 40 characters per second by a dot matrix color inkjet printer with four jets per color. The OmniColor is not cheap—cost is approximately $8000.

For more information, contact Omnico Computer Corporation, 3300 Buckeye Rd., Atlanta, GA 30341. (404) 455-8460.

Infoscribe

Infoscribe was showing a line of four relatively low-cost serial matrix printers. Perhaps the unit of most interest is the Infoscribe 500, which has a print speed of 150 characters per second and up to 136 column widths (or 224 columns with 16.5 pitch) output. The printer allows three different character width densities: 10, 12 and 16.5 which are also available in double-wide characters. Another nice feature is the ability to perform true underlining, superscripts, subscripts, and double density (which provides a bold looking output). Price of the Infoscribe 500 is $1595.

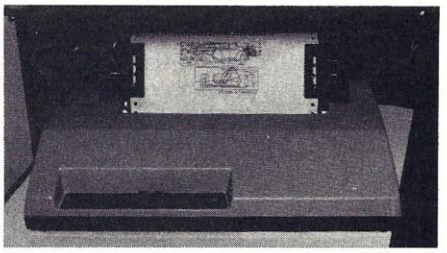
For more information, contact Infoscribe Incorporated, 2730 South Harbor Blvd., Santa Ana, CA 92704. (714) 641-9084.

MQI Computer Products was showing a new family of terminals and matrix printers. The InfoScribe 500 printer which costs $1595 prints up to 150 characters per second and has 136-column output also has superscripting, subscripting and an alternate character set stored in ROM.

"The medium is the message."
Marshall McLuhan

Axiom

Axiom was showing three printers; the middle-of-the-line was the GP-80M manufactured by Seikosha. It, like the other two Axiom printers, prints alpha-numerics as well as graphics. The printing speed is 30 characters per second. The maximum width is 80 characters which, in the graphics mode, equals 480 pixels. The printer has two different pitches (line feed dimensions), 1/6th and 1/9th inch, which are software selectable. Paper dimensions are 8-1/2 x 11 after the two side tractor feed portions are torn off. It uses uncoated paper and prints up to three carbon copies. The interface is a standard Centronics-compatible interface, although it also has optional RS-232C serial TTL and 20ma current loop interfaces. It prints regular and double size characters. Price is $359.



The Axiom Imp is a printer with full graphics capability for the Apple. Price is $599; with an Apple or TRS-80 interface the price is $659. Axiom also introduced the GP-80M mini-printer with 80 column print width and full graphics capability for just $359.

The larger and faster IMP Mini-Printer from Axiom is a 7 x 7 dot matrix impact printer which uses plain paper and prints up to three copies. It has eight switch selectable form lengths and choice of perforation skip. It prints 80, 96, or 132 columns, software selectable. It is fully bi-directional and has a print speed of up to 60 lines per minute. The IMP-2 can print 6 or 12 lines per inch, software selectable and allows subscripts, superscripts and graphics. It allows standard spacing, double size characters, and condensed spacing. Price is an attractive $599.

The third printer being shown by Axiom was the EX-850 video printer. This unique unit is the ultimate in simplicity; it requires no hardware or software interface. Rather, it connects to standard video input on most CRT displays, monitors and television sets. As the literature states, "If it is on the screen, the EX-850 prints it." This high resolution unit reproduces up to 640 pixels per horizontal scan. It prints graphics, alpha-numerics, and all character fonts.

For more information, about any Axiom printers, contact Axiom Corporation, 10104 Griswold Ave., San Fernando, CA 91340. (213) 365-9521.

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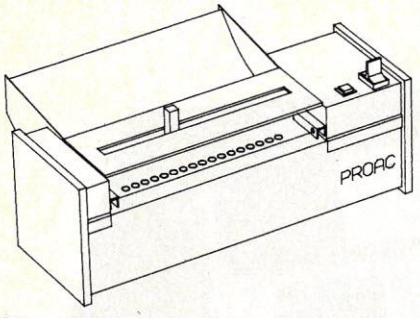

Mauro Engineering Proac plotter as drawn by itself.

Mauro Engineering

Mauro introduced a low-cost but high-resolution drum plotter. The "Proac" plotter plots on a standard paper sheet and requires only 5 bits of one parallel output port, although it can be driven by other standard interfaces. It has a resolution of 0.005 per step and plotting speed of 2.5 inches per second. It has the ability to hold a variety of different pens which, of course, allows plotting in different colors and for different uses.

Cost of the MP 250B Proac Plotter with connecting cable driver software and Pentel Pen and Holder is $695. Interfaces to either the TRS-80 or Apple are $85 each; a serial interface (RS 232) costs $195 while a Pet interface is only $25.

Proac also showed a variety of software packages produced by Leapac Services. These included the L3P Perspective Plot Package with 60 different programs for producing perspective plots, transforming 3-D coordinates, and defining a viewer's position. The subroutines are written in Fortran but can be called by programs such as MicroSoft Fortran 80, Cobol-80, Compiler Basic, and Macro-80.

Two other plotter packages being shown were the L2D-CHAR package which generates the printable ASCII character set under complete control of the user at any angle, wide or tall, slanted forward or backward, plotted close or far apart, or in a variety of other ways. Another package was the L2D-XY Vector Plot Package which contains routines for plotting X-Y curves, as well as circular and elliptical curves and ASCII characters under user control.

For more information, about any of these software products contact Mauro Engineering, 2220 Pack Trail, Mount Shasta, CA 96067. (916) 926-4406.

MicroComposer

Neither a printer or plotter, the Microcomposer is an interface between the TRS-80 and a CompuWriter I and II typesetting machine. The MicroComposer allows production of an original source document in any word processing system that runs on the TRS-80 such as Scripsit, or Electric Pencil. From that source document on disk, the MicroComposer software translates it, including control characters, to something understandable by a Compugraphic I, II or Junior. Normally, Compuwriter allows only a moving 40 character LED display. Using MicroComposer an entire document (or portion thereof) can be shown on the screen of the TRS-80 and, as it is printed out, the cursor shows the position of the character being sent to the typeset machine.

To give you some idea of what we thought of MicroComposer, when we saw it on display and operating the machine, we bought one on the spot. We have been using a CompuWriter I Junior for several years and are pleased with its results but the ability to do screen editing opens an entirely new dimension to the usefulness of the machine. CompuWriters are available on the used market for $3000-$5000 and, coupled with a TRS-80 and MicroComposer, should put true typesetting within the reach of virtually any small newsletter or magazine.

For more information, contact Cove View Press, Box 637, Garberville, CA 95440.(707) 923-3476.

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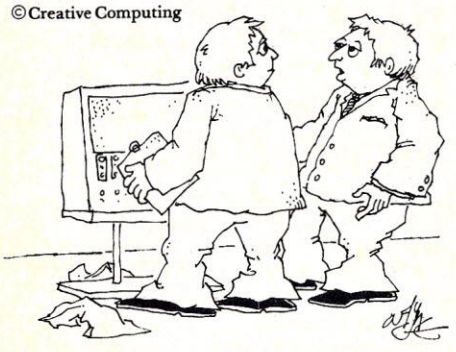

"I hate to be the one to tell you this, but for the past hour and a half you've been trying to program our candy machine."

A new terminal, The Telic Alcatel, from France, weighs only 11 pounds. It is currently being marketed by The Source Telecomputing Corporation.

Peripherals

Solid State Music

SSM Microcomputer Products Inc. will probably shoot met for referring to their company as Solid State Music. However, when one has been in the business this long, it is hard to forget that the first product introduced by this multi-line peripheral manufacturer was originally a very versatile music system designed by the equally versatile Malcolm Wright.

Now, however, SSM no longer produces a single music peripheral in their entire line and have gone into things like memory boards, interfaces, and controllers. One of the most exciting ones is their A488, an IEEE-488 controller for the Apple. What this unit does is convert the Apple computer into an IEEE-488 bus controller. While this may not sound very exciting, a whole array of peripherals are being designed and introduced around the IEEE-488 bus. These include instrument interfaces, speech synthesis units, listening units, joysticks, and the like. One of the most exciting was the one that SSM was using to demonstrate their device at the show; a Disco Vision video disk unit. Using the SSM A488 interface coupled with a Disco Vision interface, full search, forward, and reverse control was possible with a Magnavox Laser Scan Video Disk unit.

Let your imagination run wild! Using this unit, Adventure games could be written which would allow the playing of a portion of a movie disk showing, let's say, a shark attacking you. If you invoke the correct magic spell, the sequence could be run backward and the shark would be shown to be "backing-off." Other inputs could produce video sequences in slow-motion, or backwards! Just think of the unbelievable Adventure games that could be written with live video sequences running forward, reverse, slow motion and in a whole variety of different sequences. SSM, of course, does not have the software to do these things, but I would not expect it would be too long in coming.

For more information, contact SSM Microcomputer Products, 2190 Paragon Drive, San Jose, CA 95131. (408) 946-7400.

Mountain Computer

Mountain Computer was showing an expansion chassis for the Apple, which allows more than the 8 boards that you can plug into an Apple to be plugged in. The expansion chassis has space for up to 8 additional peripherals which are bank selectable from your Apple. The power supply is completely independent of the Apple, however, it does turn on and off by sensing whether your Apple computer is on or off.

Mountain was also showing a card reader! Card Reader? Yes. This device

Turn your Apple into the world's most versatile personal computer.

The SoftCard™ Solution. SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

Plug and go. The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

CP/M for your Apple. You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the versatility of the SoftCard/Apple.

CIRCLE 168 ON READER SERVICE CARD

BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COMMON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

Complete information? It's at your dealer's now. Or, we'll send it to you and include a dealer list. Write us. Call us. Or, circle the reader service card number below.

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MICROSOFT
CONSUMER PRODUCTS

Microsoft Consumer Products, 400 108th Ave. N.E.,
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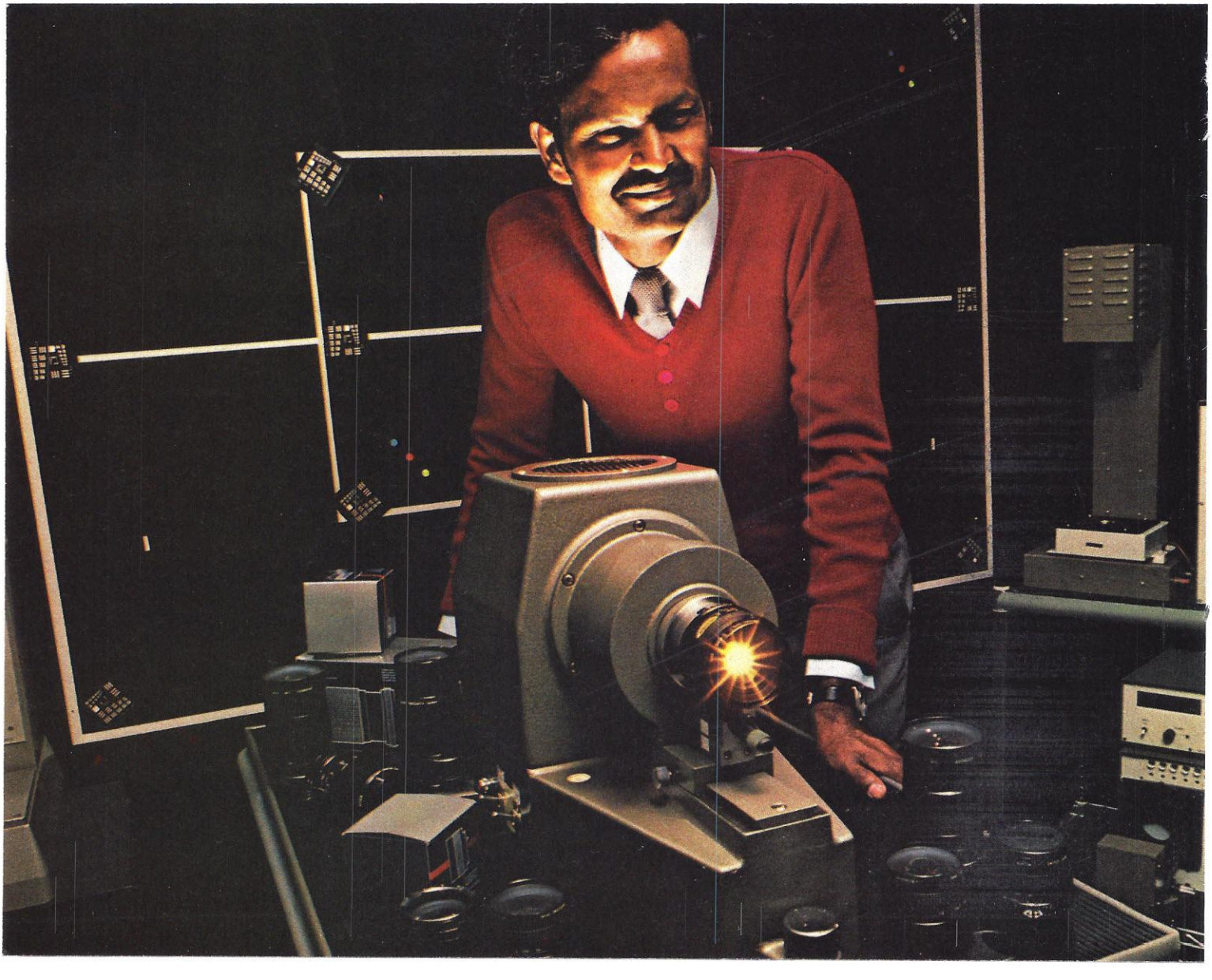
Reddy Chirra improves his vision with an Apple.

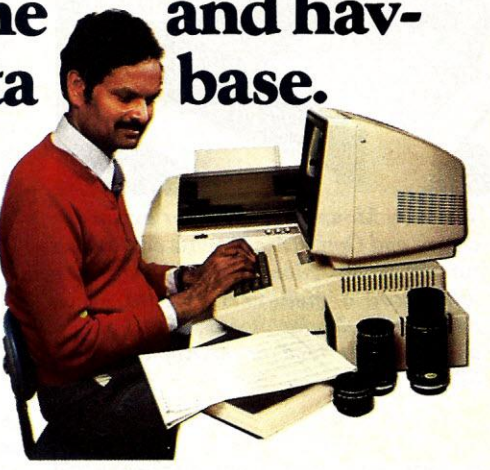
Reddy is an optical engineer who's used to working for big companies and using big mainframes.

But when he started his own consulting business, he soon learned how costly mainframe time can be. So he bought himself a 48K Apple II Personal Computer.

And, like thousands of other engineers



and scientists, quickly learned the pleasures of cutting down on shared time and having his own tamper-proof data base.



His Apple can handle formulas with up to 80 variables and test parameters on 250 different optical glasses.

He can even use BASIC, FORTRAN, Pascal and Assembly languages.

And Apple's HI-RES graphics come in handy for design.

Reddy looked at other microcomputers, but chose Apple for its in-depth documentation, reliability and expandability.

You can get up to 64K RAM in an Apple II. Up to 128K RAM in our new Apple III. And there's a whole family of compatible peripherals, including an IEEE-488 bus for laboratory instrument control.

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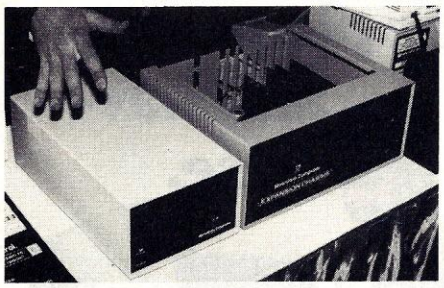
For the dealer nearest you, call (800) 538-9696. In California, call (800) 662-9238. Or write: Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 106 ON READER SERVICE CARD



The new Mountain Computer expansion chassis and Optical Mark Sense card reader for the Apple. Mountain Hardware also introduced a multifunction card which includes a calendar/clock, parallel output and serial interface for the Apple. Price is $295.

permits data entry from mark-sensitive cards to an Apple computer. It uses the optical scan mark-sense principle and permits things like Basic programming, examination scoring, and other applications requiring off-line data preparation for batch entry. Years ago, when I first got into the business of selling computers to schools, educators wanted a device which did not tie-up the central computer. Mark-sense cards seemed to be the answer and Hewlett Packard met with great success when they introduced an educational system built around that principle. DEC followed suit, although, they did not meet with quite the same level of success, since "standard" interactive systems were coming down in price and making great headway with educators who wanted to provide the maximum in interaction to the students. Now, however, we seem to be reverting back to the old times and card readers seem to be in vogue (at least according to Mountain Hardware). (Personal note, I was never particularly keen on mark-sense cards, but obviously other people are. We'll see how they do.)

Mountain, of course, had their other successful products at the booth, such as ROM Writer, ROM Plus, Introl/X10 (a device which connects the Apple to the BSR/X-10 Command Console for controlling appliances and lights), the Apple Clock, and A/D and D/A convertors, the 100,000 day Clock, and Super Talker. Personally, I particularly like Super Talker and have used it with great success at educational conferences in showing the potential capabilities of the Apple as a speech output device. Unfortunatley, not a great deal of software has been produced for Super Talker, but we hope that it will be coming in the near future.

For more information, about any of these products, contact Mountain Computer Inc., 300 Harvey West Blvd., Santa Cruz, CA 95060. (408) 429-8600.

Novation

Did you ever wonder who has that fantastic tiger picture on the modem boxes? Yes, it's the cat from Novation. The Cat modem is described as being "sleek, silent, and responsive." D-Cat is described as being "the ultimate performance in a direct modem." What does D-Cat have that Cat doesn't have? D-Cat is a 300 baud direct modem, whereas Cat, the original, is an acoustically coupled modem. Other than that they are pretty similar. Both operate on speeds up to 300 baud (although we've known people who have pushed them to speeds beyond that), they use an RS-232 interface; have data, talk, monitor, normal, and test modes; operate at half and full duplex, and, from all reports, are highly reliable.

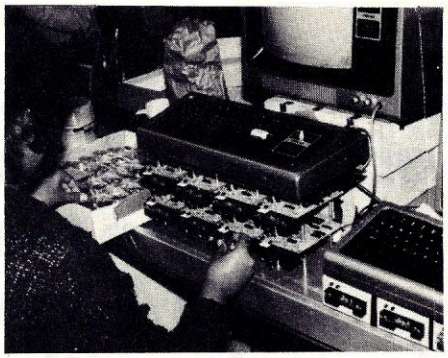
Both modems require one slot in the Apple. For more information, contact Novation, 18664 Oxnard Street, Tarzana, CA 91356. (213) 996-5060.

Novation was showing a new Apple-Cat II modem for the Apple computer.

Exatron

The first Exatron stringy floppy was introduced at the 2nd West Coast Computer Faire in San Jose in March, 1978. It met with some success, particularly among engineers and programmers, although its widespread applicability was limited by the fact that it was designed specifically for the S-100 bus system. Soon thereafter, a TRS-80 version was introduced which attracted widespread interest and sales (about 3,000 to date) and now an Apple version has been introduced.

What is a stringy floppy? It is a mass storage system, somewhat between a tape cassette and floppy disk system, that allows for storage and retrieval of files and data under computer control. It writes on an endless loop-tape system called a wafer. The wafers are slightly smaller than a business card and 3/16 of an inch thick. Wafers come in lengths from 5 to 65 feet and cost about $4 each. The transfer rate from a stringy floppy is about that of a floppy disk. Of course, data can only be transferred in serial that is, access is not random. On the other hand the cost is about 1/2 that of a floppy disk. So, one has to ask one's self, how often is random capability necessary and is the main thing I am doing transferring programs from computer to disk and vice versa? If the answer is yes to the second question, then



At the Exatron plant, eight stringy floppies are tested simultaneously.

stringy floppy seems to be a cost-effective alternative. The cost of the stringy floppy, as mentioned above, is about 1/2 that of a floppy disk system, although starter systems are packaged with a full library of software and utility routines and are priced around $350. Each starter kit consists of one drive with controller, two wafers with SOS (a stringy operating system), ten wafers of mixed lengths, two wafer organizers and manual.

For more information, contact Exatron, 181 Commercial St., Sunnyvale, CA 94086. (408) 737-7111.

Thunderware Inc.

This new company was showing a hardware peripheral, Thunderclock Plus, with two accompanying software packages. Thunderclock Plus is a clock/calendar which makes accurate time and date available to your programs: month, date, day of week, hour, minute and second. On-board batteries keep the Thunderclock running when the Apple is turned off—for up to four years before battery replacement.

The "Plus" feature is an ultrasonic interface which allows programs to transmit control signals to a BSR/X-10 command console. The command console then impresses these signals on existing 110 VAC wiring to remotely controlled lights, appliances, or other electrical devices. Computer/BSR controlled interfaces have been popular items in the last year or so,

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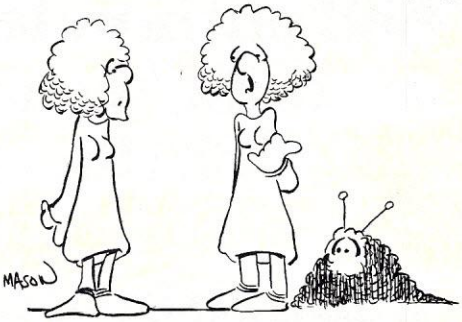

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CIRCLE 228 ON READER SERVICE CARD

however, this is the first one we've seen combining a real-time clock interface.

To increase the utility of the Thunderclock, the company has introduced two software packages: SCUTIL, which is a scheduler utility that lets you make or change a schedule. You can schedule events to occur on a daily, weekly, or monthly cycle, or on specific dates at specific times. A second program, SCHED executes your schedules in real-time using the Thunderclock. This software package runs in the "background" so you can run other programs while it is in operation.

Retail price of the Thunderclock Plus is $139, the interface to the BSR/X-10 is an additional $49 (this includes the software packages) and a Pascal software package costs $29.

For more information, contact Thunderware Inc., P.O. Box 13322, Oakland, CA 94661.

California Computer Systems

For many years we have been impressed with the professionalism and the price/performance in the design of the various boards and peripherals from California Computer Systems. No less so with the ones introduced at this Faire. Among the S-100 bus boards available from CCS, perhaps the most impressive is the Model 2422, Floppy Disk Controller. This board acts as a controller which allows reading of single or double density diskettes, automatic diskette format detect, sector size selection, and it provides control of up to four 5-1/4" or 8" disk drives. It allows for single or double density disks or IBM 3740 format disks. Perhaps most impressive, the controller comes fully supported with ROM-resident firmware with a copy of CP/M 2.2 on the accompanying disk. There is an on-board 2K ROM which provides a bootstrap loader to load CP/M.

CCS also has a comprehensive line of Apple peripherals including a ROM/PROM module, calendar/clock module, programmable timer, analog to digital convertor, IEEE-488 interface, asynchronous serial interface, synchronous serial interface, parallel interface, Centronics printer interface, and arithmetic processor.

The Model 7490 IEEE-488 interface would appear to have similar capabilities to the SSM A-488 interface and we look forward to seeing applications such as video disk controller, as well as the "more traditional" instrument interfaces implemented using this board in the near future.

CCS products tend to be highly cost-effective; the 2422A Floppy Disk Controller including CP/M 2.2, for example, has a list price of $425. The IEEE interface card for the Apple has a list price of $300. And these two products are among the *most* expensive marketed by California Computer Systems.

For more information, contact California Computer Systems, 250 Caribbean Dr., Sunnyvale, CA 94086. (408) 734-5811.

Videx

This new company was showing a line of peripherals for the Apple including a video terminal card which provides an 80 column x 24 line video display using a 7 x 9 dot character matrix. The device generates both upper and lower case and the lower case characters have full descenders. Using Video Term in slot 3 provides Pascal programs immediate control of the display since Pascal recognizes the board as a standard video display terminal. Price of the Video Term is $345.

Videx also has a keyboard and display enhancer which "puts the shift and shift-lock back where it belongs." In addition to allowing the shifting on the keyboard, upper and lower case characters are shown on the screen as you type. The device is completely compatible with Apple Writer, Super Text, and other word processors. Price of the unit is $129.

Videx was showing Apple peripherals including the Video Term, an 80 column 7 x 9 character matrix display board for the Apple, as well as another board that allows you to shift from upper to lower case in the normal way. It works with the Apple Writer, Super Text and other 40 column word processing systems.

Videx also introduced a board called the "Romulator." This device is aimed mainly at the serious programmer and hardware developer. It basically replaces the ROMs of the Apple with RAM software. The device includes a global editor, font editor, serial I/O driver for the game port, and medium resolution graphics routines. Price for you serious Apple buffs is a mere $199.

For more information about these products, contact Videx Inc., 897 Northwest Grant Ave., Corvallis, OR 97330. (503) 758-0521.

In exercising his imagination, man creates life and adds to the sum of living experience.—C. M. Bowra

H.C. Pennington Speaks Out

At the West Coast Computer Faire I had an opportunity to talk with with H.C. Pennington, author of the best selling *TRS-80 Disk and Other Mysteries*.

D.A.: What other books are in your line?
H.P.: Our latest book is *Microsoft Basic Decoded* by James Farvour. It took off like a scalded ape, with 3800 books shipped the first day. That's not bad.
D.A.: What's the title of the Apple one?
H.P.: *Apple Disk and Other Mysteries*. It will be about the disk and not the disk operating system. It will explain things in English, and I quote Dennis Kitsz, "it is a difficult second language for programmers." I write pretty much like I talk so, as Bill Barton describes it, it is colorful. It will have illustrations and not these convoluted explanations of what a track is. I will actually illustrate the sector as it appears in a screen dump and highlight each byte and describe in English what that byte does and how to decode that byte and then the next one. We will go through the entire directory, how it is organized and what you can do from Basic such as fooling it, making it think the whole disk is a big file. It will discuss how to recover from a parity error or a physically damaged disk where we have lost the sector because someone has put a pencil point through it or laid a magnetized paper clip on it. It will contain all the things that go wrong on the Apple. Of course, according to Apple owners, that never happens.

A book scheduled for June is *TRS-80 Hardware Decoded* by Dennis Kitsz. It's a 400-500 page manuscript and will contain about 60 photographs and 100 drawings and diagrams including the software to run the modifications or to interface them or whatever.

We have another book that is about 80% completed that will be on Advanced Basic Programming Techniques for the TRS-80, actually for any Microsoft Basic. It has non-trivial functions and subroutines; not the usual run of the mill GOSUB or a payroll program type thing or all of the things that have been rehased over and over. Techniques like using variable pointer to point strings at the screen and then being able to L-set into them which turns out to be a very fast routine to give you control of the screen as if you were in machine language. The book has approximately 250 of these routines, and examples of how to use them and how to change them. The author of that book is Louis Rosenfelder.

For more information about these books, contact IJG Computer Services, 1260 W. Foothill Blvd., Upland, CA 91786. (714) 946-5805.

4 ALL NEW GUIDES

from OSBORNE/McGraw-Hill

The Apple II User's Guide by Lon Poole, Martin McNiff, and Steven Cook #46-2, $15. ☐

This Guide is the key to unlocking the full power of your Apple II or Apple II plus computer. The Apple II User's Guide brings together in one place a wealth of information for Apple computer users. It will tell you more about your Apple than any other single source. This book will save you both time and effort. No longer will you have to search endlessly for useful information. It's all here, in the Apple II User's Guide, thoughtfully organized and easy to use. Topics include:

*Applesoft and Integer BASIC programming - especially how to make the best use of Apple's sound, color and graphics capabilities. The book presents a thorough description of every BASIC statement, command and function.

*Advanced programming - special sections describe High Resolution graphics techniques and other advanced applications.

*Hardware features - the disk drive and printer are covered in separate chapters.

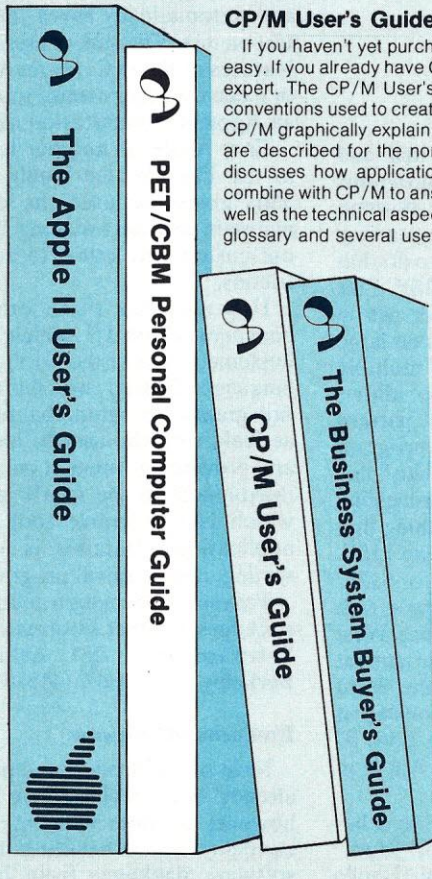
*Machine level programming - although not a machine language programming guide, this book covers the Machine Language Monitor in detail.

*Apple is a trademark of the Apple Computer Corporation.

PET/CBM Personal Computer Guide *Second Edition* by Adam Osborne and Carroll Donahue #55-1, $15. ☐

The *PET/CBM Personal Computer Guide* is a step-by-step guide that assumes no prior knowledge of computers. If you can read English, you can use this book. This revised second edition provides even more useful material than the popular first edition. It covers the most recent CBM products: the CBM 8000 and 4000 series computers, the 2040 and 8050 disk drives, and programmable printers. Adam Osborne co-authored this new edition. He has re-written it to be a step-by-step BASIC tutorial. So if you don't know BASIC, don't worry. This book will teach you both BASIC and CBM BASIC. If you're thinking about buying any personal computer, this book will show you what the PET can do for you. If you've just bought a PET or CBM, this is the book you must have to really understand your computer. By using the examples found in this book you'll quickly get your PET/CBM up and running. These examples are thoroughly documented so you can learn how and why the programs work. It's the "how" and "why" that are important in learning to make the PET work efficiently for you. The PET Personal Computer Guide covers everything you'll need to be master of your PET.

*PET and CBM are both trademarks of Commodore Business Machines.



CP/M User's Guide by Thom Hogan #44-6 $12.99 ☐

If you haven't yet purchased CP/M for your system, the CP/M User's Guide will make your first use of CP/M easy. If you already have CP/M, this book will help you modify your system and let you "jockey your disks" like an expert. The CP/M User's Guide describes types of CP/M and their compatibility. It includes a discussion of conventions used to create file names and command lines. Numerous sample screen displays for each version of CP/M graphically explain each operator command and computer response. CP/M's Assembly Language Utilities are described for the non-technical reader who wants maximum use of CP/M's capabilities. The book also discusses how application packages, high level languages, solution programs, and other support programs combine with CP/M to answer a user's individual needs. You'll also find an explanation of MP/M and CP/NET as well as the technical aspects of CP/M's internal structure which will permit you to make simple modifications. A full glossary and several useful appendices are included.

*CP/M is a trademark of Digital Research Corporation.

The Business System Buyer's Guide by Adam Osborne #47-0 $7.95 ☐

When you enter the marketplace of small business computers you face a bewildering array of products, prices, features, and fables. This guide cuts through the jargon and unravels the task of buying the right computer system. Dr. Osborne is the foremost authority on the use of computers in small businesses. Here, he helps you to analyze your computer needs by applying the same know-how that made your business a success. This book provides solid information on how to determine your needs, how to choose software and hardware for all business applications, what to expect from vendors, what to avoid, and what questions you must ask. It also provides a wealth of detailed information on products, manufacturers, retailers, and the whole microcomputer marketplace. Purchasing a computer system for any business is a complex process, but it need not be a frustrating one. This book will help. Before you buy any computer, read this book. You'll never make a better investment.

Make check payable to: **OSBORNE/McGraw-Hill**
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CIRCLE 251 ON READER SERVICE CARD

Lazer Microsystems

Yet another lower case board for the Apple was introduced by Lazer. This is a plug in circuit board which does not require an additional card slot. Like other lower case adaptors it is compatible with most word processors including Apple Writer, Super Text, Apple Pie, etc. It is also compatible with Integer, Apple Soft, Pascal, and CP/M. Unlike other boards, Lower-Case Plus includes a 2716 compatible character generator which allows the user to create his own fonts, and includes two selectable character sets on-board (word processing and graphics). Price is $69.95.

In addition to Lower-Case Plus, Lazer also introduced Keyboard Plus, which allows basic programs using the input statement to accept both upper and lower case characters into the programming. In addition, special purpose characters such as the back slash, underline, apostrophe, and brackets may be directly entered from the Apple keyboard. Price for the Keyboard Plus is $119.95.

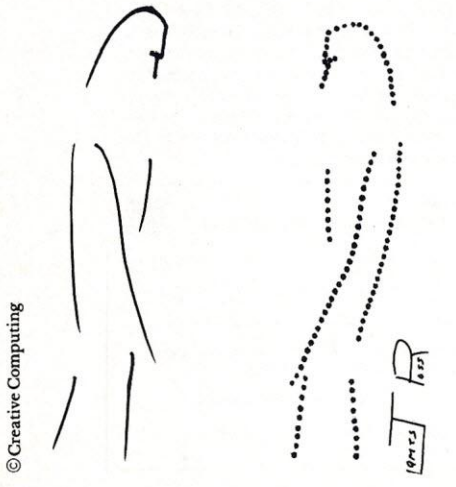
A third product from Lazer is Graphics Plus, which is a RAM-based character generator which attaches to the lower case bus expansion socket. It has an on-board RAM buffer with enough room to define up to 128 different characters.

For more information, contact Lazer, P.O. Box 55518, Riverside, CA 92517. (714) 682-5268.

Micro-ware Distributing

Part of the fun of the Computer Faire is meeting people who walk around with a brief case and invite you to their portable office to look at a brand new product. Some of these people don't quite have enough money to invest in a booth, or have just gotten their product finished a day before the Faire opens and did not have the foresight to get a booth, but in any event, have something worthy of a look/see. Micro-ware is one such case. They had a "double DOS Plus" board, which is a plug-in board for the Apple that allows the computer to be switched back and forth between DOS 3.2 and 3.3. It uses a back-to-back alignment so it only takes up one card slot and allows other cards to be plugged in to adjacent slots. Price is $39.

For more information, write Micro-ware Distributing, Inc., P.O. Box 113, Pompton Plains, NJ 07444. (201) 839-3478.



©Creative Computing

"I have never found legibility to be a problem with dot matrix printers."

Axlon

Want more memory for your Atari 400 and 800? Axlon may have the answer in one of their two products. One, the RAMCRAM is a 32K RAM memory module which plugs directly into the Atari 400 or 800. Doubling the capacity of the Atari 16K modules, RAMCRAM allows 32K bytes to be plugged into one single expansion slot.

In addition, Axlon introduced a separate box to house a memory system of up to 256K. This system is designed to accept up to 8 of Axlon's 32K RAMCRAM modules. It comes with two modules (64K), memory management software, interface card and cable.

For more information, contact Axlon, 170 Wolfe Road, Sunnyvale, CA 94086. (408) 730-0216.

Software

Datasoft Inc.

Years ago, I went through hell and high water to convert several programs from LISP to Basic, most notable of which was Eliza (Doctor). Had I been starting out today I would not have had to do that since Datasoft just introduced LISP. This language was first developed for use in artificial intelligence applications on large computers. It permits storage of multiple programs in memories. It also allows relational data base capabilities, pattern directed invocation, user and program definability. These may all sound like "blue sky" go words, however for list processing and string processing, there's nothing that equals the power of a language like LISP. It is now available for the Apple for $125.

Datasoft was also showing Mychess, with nine levels, the winner of the Fifth West Coast Computer Faire Chess Tournament and highest finishing program in the Third World Computer Chess Championship at Linz, Austria. It is available on both 8" CP/M disk ($49.95) and for the Apple in a Z-80 softcard version ($34.95).

Datasoft was also showing three other games: "The Resurrection of Iago," described as the ultimate Reversi/Othello game that's available for the TRS-80 Model I & III. Two other game packages Arcade

80, and Football Classics were also on display.

For more information about these products, Micro Painter, and a joystick controller called Le Stick for the Atari, write Datasoft Inc., 19519 Business Center Drive, Northridge, CA 91324. (213) 894-9154.

Information Unlimited Software

On these pages we have, several times, reviewed Easy Writer from IUS. In general our writers liked it. However, IUS has several other packages which may also be of interest. Easy Mover is an electronic mail system for Apple users. It is "the first such system to combine the versatility of a word processor with the ability to move text files over the phone to another Apple II computer." Easy Mover automatically dials a phone number that you have given it, connects it to another Apple, moves your text across the phone line, and automatically saves the transmitted text on disk. The system uses the automatic features of the D.C. Hayes Micro modem or it can use other manual modems through an Apple communication card.

Easy Mailer is another building block in the Easy Writer family of products. This gives the user the capability to maintain and sort mailing lists and send out customized letters to customers and friends.

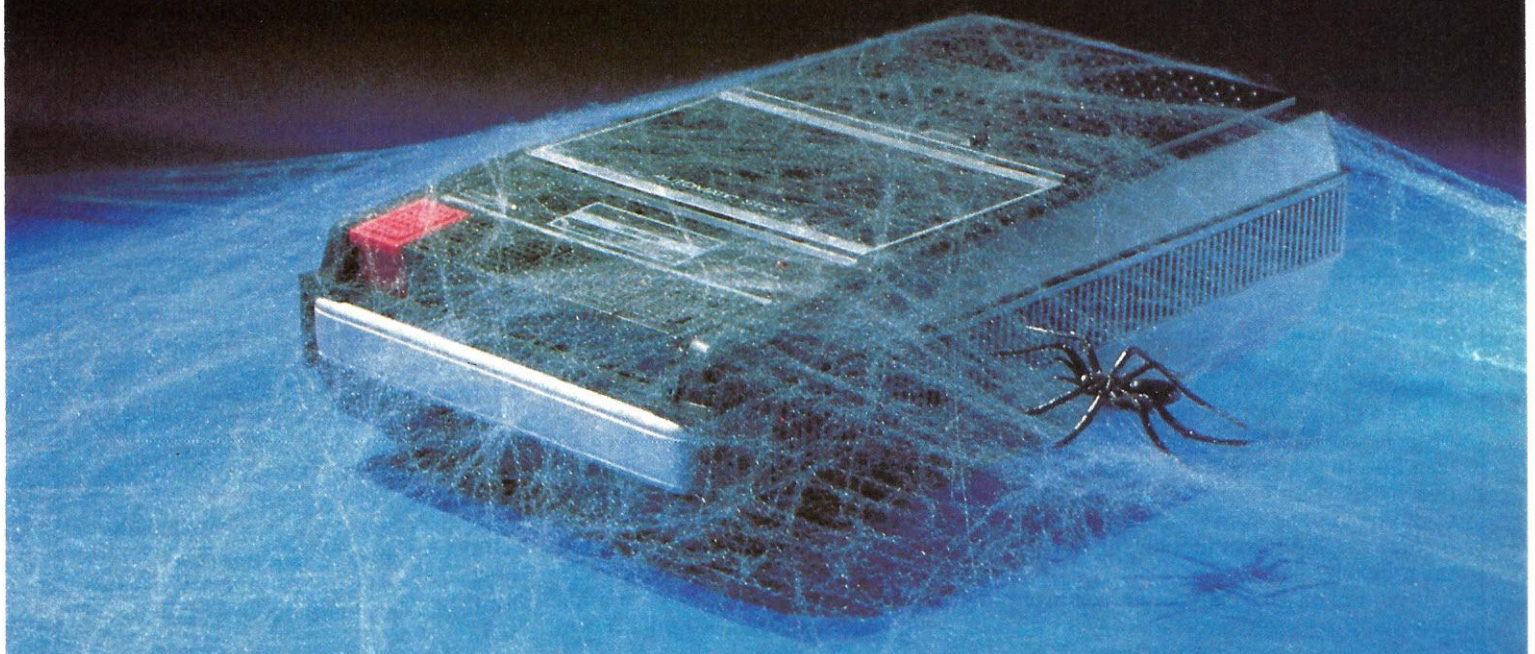
IUS also has three other software packages: Forth 1.7, which is a powerful implementation of the Forth programming language; Tellstar, which is a high resolution graphics program that responds interactively with the user to locate, identify and provide information on stellar objects (astrologers to the fore!); and Datadex, which is a software tool for business applications. Datadex is a data entry, sorting, and retrieval program.

For more information about any of these packages, contact Information Unlimited Software Inc., 281 Arlington Ave., Berkeley, CA 94707. (415) 525-9452.

Broderbund Software

Most of the Broderbund packages have already been reviewed on these pages, however we note with interest that the company is now handling the Star Craft software packages from Japan. These include Demon Derby, Galaxy Wars, and Golden Mountain.

TIRED OF WAITING?



Frustrating isn't it! No matter how much you speed up your program it still seems to take forever to save data onto a cassette. Wouldn't it be great if someone could design a mass storage system with the speed of a disk, but at half the cost? *Exatron* did, the *Exatron Stringy Floppy (ESF)* .

Totally self-contained, the ESF is an extremely fast, reliable, and economical alternative to cassette or disk storage of programs or data. All of the ESF's operations are under the computer's control, with no buttons, switches, knobs or levers to adjust or forget.

The ESF uses a miniature tape cartridge, about the size of a business card, called a wafer. The transport mechanism uses a direct drive motor with only one moving part. Designed to read and write digital data only, the ESF suffers from none of the drawbacks of cassettes - without the expense of disks.

Several versions of the ESF are available, for the *TRS-80, Apple, PET, OSI* and an *RS 232* unit. Even the slowest of the units is 15 times faster than a cassette, and all are as reliable as disk drives - in fact a lot of users say they are *more* reliable!

excellence in electronics

exatron

To get further information about the ESF give Exatron a call on their Hot Line *800-538 8559* (inside California 408-737 7111).

If you can't wait any longer then take advantage of their 30 day money-back guarantee, you've nothing to lose but time!

181 Commercial Street
Sunnyvale, CA 94086

TRS-80, Apple and PET are trademarks of Tandy, Apple and Commodore respectively.

CIRCLE 174 ON READER SERVICE CARD

In addition Broderbund is selling Alien Rain, in which aliens swoop down from all sides in dazzlingly swift attacks to do battle upon the loan defender. You may recognize this program under a different name, however, the name battle is one in which we will not get into on these pages. A hopped-up version of this program is known as "Alien Typhoon for fanatics only! Twice as many, twice as fast, and twice as tricky."

For more information about any of these packages, contact Broderbund Software, P.O. Box 3266, Eugene, OR 97403. (503) 343-9024.

Shafer Software

Here's a company with a new idea. Shafer believes in selling everything by direct mail and not through stores. The reason for this is so they can keep more packages in their line and support them directly rather than having stores say, "We just want two or three packages. Give us your best sellers." Shafer Software also is concentrating on self-help and education packages and consequently do not expect "big sales" through retail stores.

Some of their initial offerings include, Moonlighter Tax Guide which shows the user how to keep track of expenses, take every deduction available, short-cut the form fill-outs, and even build another side income helping fellow moonlighters with tax problems.

If you are an arm-chair golfer, you may find the "Pro-Golfer" program of interest. This programs tests your judgement of distances, angles, wind, moisture, hazards, and slope as you drive, chip and putt an eighteen hole course. With the separate "Golf Architect" disk you can design your own course and play golf on it or challenge your friends to play.

Are you a puzzle buff? If so, Word Search Machine and/or Crypto Machine may be your cup of tea. Each generates thousands of puzzles which you can solve yourself, give to friends, or, you can use the programs to solve puzzles in newspapers and magazines.

There are programs for pre-schooler parents, aspiring musicians, bible students, and beginning programmers. For more information, contact Shafer Software, 465 So. Mathilda Ave., Ave., Sunnyvale, CA 94086 (408) 730-0179.

Artsci Inc.

Artsci was showing a new word processing system, Magic Window, for the Apple. Unlike other systems, Magic Window allows you to type up to 80 characters per line and actually see exactly what wil be printed on the screen. It also has a "type-ahead buffer" which allows you to type on the keyboard as fast as you possibly can without losing any characters or words. Its four-way scrolling allows the user to view 80 columns on a 40-column screen. Like other text editors, Magic Window allows you to manipulate characters, words, lines, paragraphs; do centering; do justification; and, like a typewriter, has an unlimited number of tab stops which you may set.

Artsci also introduced four new program tapes for the Atari 400 and 800. These include Reversi, the ancient name for the popular board game Othello. Reversi sells for $19.95. Gomoko, is a game played by children in the orient the way the American children play Tic-Tac-Toe. It requires the player to place five or more of his men in a row to win. There are three different levels of difficulty on this tape which sells for $19.95. PokerSolitaire is a variation on the popular card games, Solitaire and Poker. In it, the player is given 25 cards, one at a time, which must be positioned horizontally or vertically in a 5 x 5 array to create the best possible Poker hands. Price is $14.95. Cypher Bowl is a football simulation which allows combination of offensive and defensive plays. This two-player game uses full-screen scrolling and animation for "realistic excitement." Price is $29.95.

The Softape Booth. Softape, although well noted for their games introduced a new word processor for the Apple called Magic Window.

Artsci products are distributed by Softape, 10432 Burbank Blvd., North Hollywood, CA 91601. (213) 985-2922.

Atari

Atari was not exhibiting at the Faire per se, however, their software acquisition group was attempting to acquire software for Atari 400 and 800 computer systems. We talked to the Atari people about this effort and expressed our concern that this program might discourage independent and second source software producers from developing and marketing material for the Atari. After all, if Atari is getting all of the best software submitted to them by freelance software authors, it would make competition by independents much more difficult. And what author wouldn't submit software to Atari given the $100,000 contest for software authors?

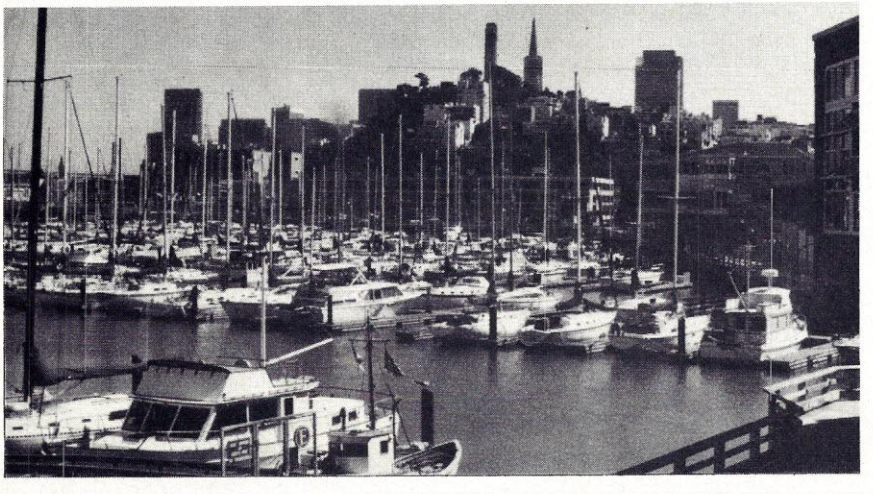
On the other hand, we also sympathize with Atari and recognize the validity of their view, "the more software that is available, the more computers you will sell."

In any event, the program is going into operation and Atari intends to distribute the programs at a modest cost through a catalog, the first edition of which is due out in mid-May. Program authors will be paid quarterly for submissions based on actual sales. And, as mentioned above, there is a contest with a grand prize of $25,000 in cash and $75,000 in Atari products to runners-up.

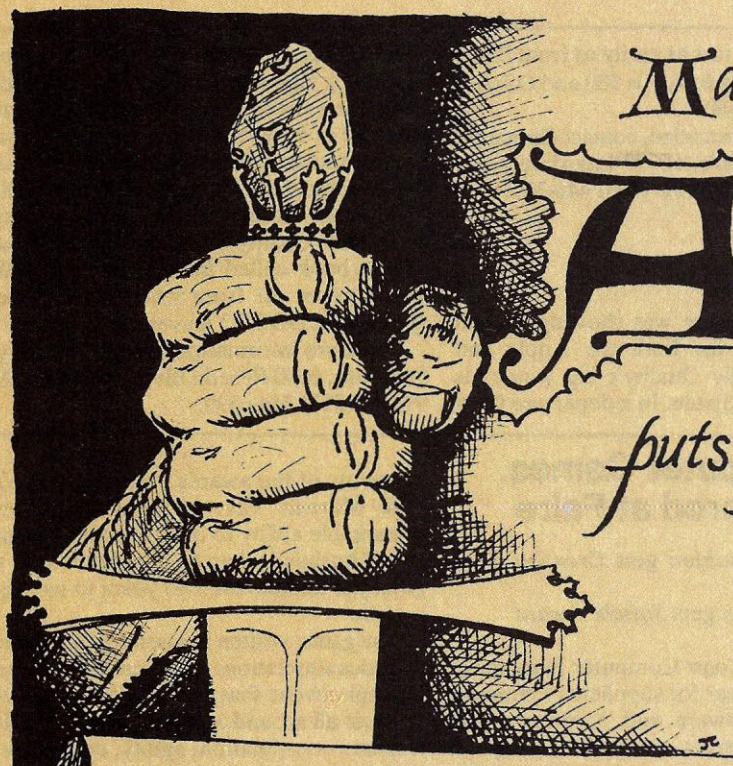
For more information write, Atari Software Acquisition, 1196 Borregas Ave., Sunnyvale, CA 94086.

Optimized Systems Software

The founders of this company have rather impressive credentials, having written the original Apple DOS, all versions of Atari Basic and Assembler/Editor, Cromemco 16K Basic and Cromemco C-compiler. Hence, one must sit up and take notice of Basic A+ for the Atari 800 and Apple II . Basic A+ is totally upward compatibile from the 10K Atari Basic and has many additional features. Enhanced



San Francisco, site of the 6th West Coast Computer Faire, as seen from Pier 39.



Mark of the Unicorn

Amethyst

puts you in Command of your text

Talk with Amethyst about words, sentences, paragraphs, chapters, quotations, footnotes, and more——it understands. Its ability to edit and display several documents and programs at once is absolutely unequaled by any other system.

Amethyst can be modified to suit your needs because we supply the source for the commands. You can arbitrarily alter the behavior of any command!

One year's support is included——we don't leave you to fend for yourself. And our thorough, readable documentation has received high acclaim from our users. Amethyst comes with the BDS C compiler. How many other word processing systems let you write programs as well?

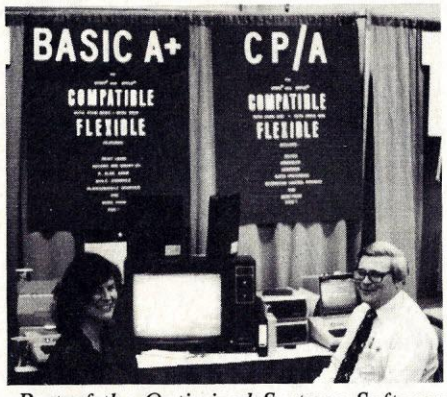
Amethyst $350 (less C compiler $250) manual $35

Mince (Amethyst text editor) $125 manual $15 demo disk $10
Scribble (Amethyst text formatter) $125 manual $15
Mince and Scribble ordered together $175

48K CP/M® required. Available on 8" soft sector diskettes. Mince and Amethyst require a cursor-addressable terminal. Dealer, site, OEM, and **NIX versions and licenses available.

Mark of the Unicorn, P.O. Box 423, Arlington, MA. 02174 (617)489-1387

CIRCLE 218 ON READER SERVICE CARD



Part of the Optimized Systems Software team, on the left, Kathleen O'Brien and the right Bill Wilkinson. Optimized Systems Software has introduced Basic A+ and CP/A for the Atari and Apple computer systems.

input/output includes print using commands, protect/unprotect, rename and erase and extended storage commands. Basic A+ includes meaningful error messages rather than Error 131 or Error 4 for example; it has a trace command, SET and SYS commands. It includes Algol-like constructions including if . . . else. . . end if and while . . . end while. It also includes player missile graphic commands.

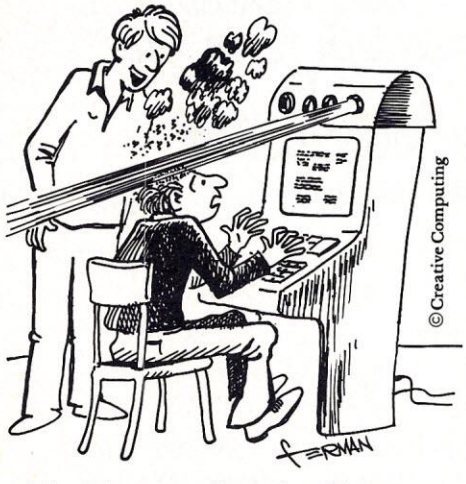
In addition OSS has introduced an operating system for both the Atari 800 and Apple II, OS/A+. Intrinsic commands of the system include protect/unprotect, save, load, erase, rename, run and directory. In addition, it has a host of system utilities which permit the user to format and initialize new disks, copy single files, and duplicate entire diskettes. It also permits the addition of the user's own device drivers, commands, and access to all system features from the assembly language level just as easily as from Basic A+. Price of Basic A+ is $80 and OS/A+ an additional $80.

For more information, contact Optimized Systems Software, 10379 Lansdale Ave., Cupertino, CA 95014. (408) 446-3099.

Quality Software

Quality Software was showing several new products for both the Apple and Atari. Currently Quality's big winner is Meteoroids in Space. In a departure from games, they introduced QS Forth, a programming language they feel will do better than the existing Forth implementations because of very extensive documentation and a much better description of the commands of the language than are available from other sources. In another departure, Quality Software is coming out with a book called *Beneath Apple DOS* which takes off from where the Apple Manual on DOS 3.3 leaves off.

For more information, contact Quality Software, 6660 Reseda Blvd., Reseda, CA 91335. (213) 344-6599.



"Oh, I forgot to tell you that this space war program uses more than an audio visual retalitory system."

Computer Games Honored at Faire

Olympic Decathlon gets *Creative Computing Award*
Super Invasion gets *Softalk Award*

The West Coast Computer Faire is the party of the year for suppliers of personal computer software and hardware. The stimulating mixture of suppliers, computer hobbyists, and interested consumers, the carnival atmosphere, and the gathering of personal computing "old timers" offer a perfect opportunity for recognition of significant achievement within the industry. In an awards ceremony at the Faire, *Creative Computing* and *Softalk* magazines presented awards to outstanding programmers.

Creative Computing Award

Creative Computing, the first magazine to offer computer games as a regular feature, presented an award for exceptional creativity and originality in game programming. The award was presented to Timothy W. Smith, of Plymouth, MI, honoring his programming of the game Olympic Decathlon.

Tim left his job as a systems programmer for Burroughs in the summer of 1979 and worked at home full time for the next ten months to produce the game on the Radio Shack TRS-80 computer. He then spent the following ten months creating a version for the Apple II. In one of the lighter moments of the awards ceremony, Tim's wife Marcea was recognized for her remarkable ability to offer encouragement to her husband when he decided to quit a good job and devote two years to writing a game

Tim Smith, left, receives the first annual "Most Creative Game" award from George Blank, editorial director of Creative Computing.

The game, written in assembly language, includes simulations of all ten parts of the Olympic event that is intended to select the best all around athlete in the world. It requires coordination, agility, concentration, and good judgment to score well in the computer simulation, remarkably parallelling the real event. The computer game offers exceptional graphics, including animation and, in the Apple II version, color and music. From one to eight persons may compete at the same time. A brief review of the game appeared in the April 1981 issue of *Creative Computing* and a full review is planned shortly.

Olympic Decathlon sells for $24.95, on tape or diskette, for the TRS-80 Model I and the Apple II. It is produced by Microsoft Consumer Products, 400 108th Ave. N.E., Bellevue, WA 98004.

Softalk Award

Following the Creative Computing Award, *Softalk* presented an award for the most popular Apple program of all time. *Softalk*, a magazine that is sent free to registered owners of Apple computers, ran a poll in their magazine to determine the winner of the award.

The winning program was Super Invasion, distributed by Creative Computing Software. Since the Japanese author desired to remain anonymous, the award was symbolically given to a West Coast distributor. The second and third place finishers, Adventure from Microsoft and Visicalc from Personal Software, were also announced.

Super Invasion is a faithful recreation of the arcade game Space Invaders. It is available for the Apple II from Creative Computing Software, 39 East Hanover Ave., Morris Plains, NJ 07950. The cassette version is $19.95 and a diskette version, including the classic computer game Space War, sells for $29.95. A version of Super Invasion for the Exidy Sorceror is due this summer from the same company.

NOW! FOR ATARI®

BASIC A+

NEW! FOR APPLE®

FROM THE AUTHORS OF ATARI® BASIC

BASIC A+ for the ATARI 800™

BASIC A+ will rate an A+ from any Atari user! Upward compatible with Atari Basic, it adds statements and features that enhance the Atari 800's real power, flexibility, and ease of use: Superior I/O features for business and other applications. Additional file manipulation commands. Significant help in program development and debug. Structured programming aids. And MORE! A partial list of the enhancements of **BASIC A+** includes:

PRINT USING (for business, sophisticated)
RPUT/RGET (record I/O) **SET TAB**
BPUT/BGET (binary I/O) **INPUT"..."** **DIR**
ERASE PROTECT RENAME TRACE
WHILE...ENDWHILE IF...ELSE...ENDIF
PLAYER/MISSILE GRAPHICS

BASIC A+ requires a disk and 32K bytes of RAM. Since no cartridge is used, BASIC A+ will take advantage of all the RAM (48K bytes) in a maximum Atari 800 system (recommended).

OS/A+ for the ATARI 800

Simple. Flexible. Powerful. Compatible. A command driven DOS Control Program that allows user-written commands, ease of interface, and total compatibility with all devices and features of the Atari DOS and file system. Using less room than a menu-driven DOS, **OS/A+** allows utilities to be dynamically accessed from disk as needed.

Powerful Utilities INCLUDED with OS/A+

All the following utilities are **included** in the price of **OS/A+**, but you can easily add your own for even more flexibility and power.

EDITOR/ASSEMBLER/DEBUG

EASMD is a simple but complete all-in-one assembly language development package for the 6502 microprocessor. The editor provides global functions such as FIND and REPLACE (with optional query!) and can be used to edit **BASIC A+** programs. The assembler supports standard 6502 mnemonics; can include multiple files in a single assembly; outputs the listing to printer, screen, or disk; produces readable error messages and a flagged symbol table; places the object code in memory or to a disk file. The object code produced is compatible with Atari DOS or Apple DOS (BLOAD) as appropriate. The debug capabilities include STEP, TRACE, mini-assembler, disassembler, and more.

DUPDSK and FORMAT

Allows creation of master disks, slave disks, and sector-by-sector copies of any **OS/A+** disk.

COPY

Single file copy utility. Destination can be disk, screen, printer, or any device.

PARTIAL SOURCE CODE

For system equates and some system drivers. Customize your system.

BASIC A+ for the APPLE II®

All the features* of our Atari **BASIC A+**! Includes the advanced commands and programming aids that make Atari Basic flexible, easy-to-use, and powerful:

DECIMAL ARITHMETIC (10 digits to the penny)
SYNTAX CHECK ON PROGRAM ENTRY
LONG VARIABLE NAMES (all chars. used)
STRINGS UP TO 32K BYTES IN LENGTH
SEMI-COMPILED CODE (no penalty for those long names)

BASIC A+ requires and takes advantage of all the features and power of **OS/A+**.

*Some Atari hardware related features cannot be supported on the Apple II.

OS/A+ for the APPLE II®

A DOS with a **DOCUMENTED** assembly language interface! Simple. Elegant. Upward compatible with the file systems of Apple's DOS 3.2 and 3.3 but with flexibility not available until now. Add your own commands. Add your own device drivers. Easy FAST random access from assembly language or **BASIC A+**. Requires 48K RAM and one disk drive. Hundreds of Apple owners enjoy OS/A+ under its former name, CP/A.

ORDER TODAY!

All software is licensed for single system use only. **PLEASE SEE YOUR DEALER FIRST.** If he cannot supply you, ordering info is below. DEALER AND DISTRIBUTOR INQUIRIES INVITED.

	Atari	Apple
OS/A+	$ 80	$ 80
BASIC A+	$ 80	N/A
OS/A+ & BASIC A+	$150	$150

Add $5 per package shipping in U.S. 6% tax in CA.

OS/A+ and BASIC A+ are trademarks of Optimized Systems Software. APPLE and APPLE II are registered trademarks of Apple Computer, Inc. ATARI and ATARI 800 are registered trademarks of Atari, Inc.

Optimized Systems Software
10379-D Lansdale Avenue
Cupertino, CA 95014
(408) 446-3099

master charge VISA Checks, M.O.

CIRCLE 245 ON READER SERVICE CARD

ATARI* 800* OWNERS!

NOW expand to 256K RAM MEMORY CAPACITY!

Eight memory slots for your Atari 800! The AXLON 256 MEMORY SYSTEM has the capability to bank-select up to 256K of on-line RAM memory. The system is designed to accept Axlon's 32K RAMCRAM modules, Atari's RAM modules, or a combination of the two. Our memory system comes complete with hardware, 64K of RAM, memory management software, interface card and cable. Drop by your local computer store or contact Axlon for more information.

AXLON 256™
MEMORY SYSTEM

170 Wolfe Road
Sunnyvale, CA 94086
(408) 730-0216

AXLON

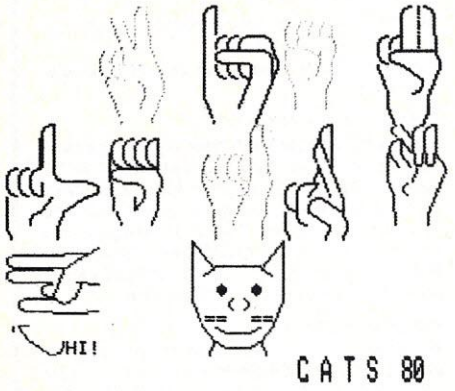
- 64K of RAM *included* with system
- Quarter Megabyte RAM Capacity
- Atari 800 compatible interface card and cable
- Memory management software included
- Accepts Axlon 32K RAMCRAM modules, Atari RAM modules, or a combination of both
- Dedicated power supply
- 90 Day Warranty

CIRCLE 114 ON READER SERVICE CARD

*Indicates trademarks of Atari, Inc.

Intelligent Systems Corporation

Well, Intercolor seems to be back with us with the 3600 series of terminals and desk top computers. We've always admired the Intercolor product line and have been much impressed with the color graphics capabilities. However, the company has usually come up a bit short in their marketing prowess.



A portion of the CATS screen reduced from a full-color line printer listing.

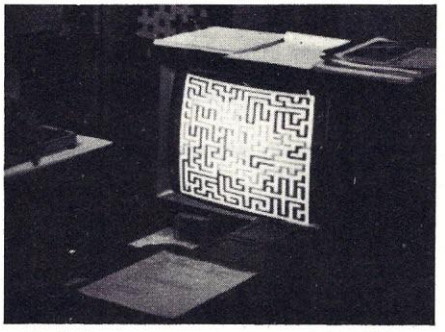
However, almost more interesting than the hardware, is a software system known as "CATS80" (Computer Augmented Teaching System for the 80s) written by Thomas J. Huston. We've known Tom for a long time and have followed his career from a computer artist in Indiana to a courseware author in Florida and now Georgia. CATS is a software system somewhat similar to PILOT. However, it is highly user oriented and completely interactive. Basically it allows an author/teacher to create a course on any subject without any knowledge of the computer or computer program. In addition to allowing the creation of the material, CATS also presents it to the student and keeps a full accounting of student progress for later reference by the teacher. A second version of the system VCATS (Visual CATS80) is available for use in education of deaf people.

For more information, contact Intercolor, 225 Technology Park, Norcross, GA 30092. (800) 241-4310.

Creative Computing introduced 15 new software packages and new packaging for the entire Sensational Software line.

Softsync Inc.

Super Invasion for the ZX80? No way, you say. But Softsync has found a way. This amazing program is totally flicker free, has three levels of play in each game and full moving graphics just as found in versions on the Apple and larger computers. Also available is Double Breakout, which has two barricades. It also has three levels of play, two ball angles and a curved bat to keep the excitement going for hours. Amazingly enough both of these programs fit in 1K of memory in the basic Sinclair ZX80 or MicroAce. Cost is $14.95 each. For more information contact, Softsync Inc., P.O. Box 480, Murray Hill Station, New York, NY 10156.



ComPac *recently introduced an AppleTime Clock module for the Apple, a TLB microcomputer, XPLO (a Pascal-like language for the Apple) and APEX, an executive program for the Apple. The program on the screen is called WEAVER2, which creates weaving patterns on an Apple.*

Other Stuff

Computer Sculptures

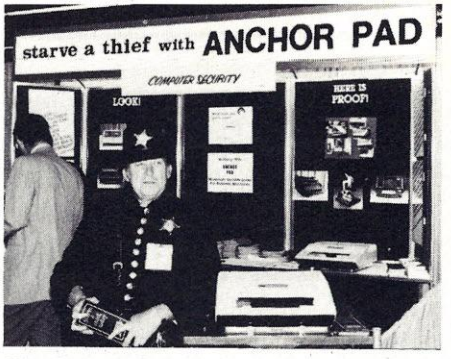
Dave Dameron described his technique. "I built a machine run by stepping motors. It's a turntable that rotates where I put a block of wax. It has two carriages, one that moves up and down and one that moves in and out. On the end there is a rotating cutting tool. I start with a block of wax and, under computer control, it carves out a mathematical shape. You can also trace a shape by using a stylus which runs over the surface instead of a cutting tool.

Dameron also mentioned that he made things that look like textured 3-D mazes on surfaces of things by using a random number generator.

The address is Computer Sculptures, Dave Dameron, P.O. Box 784, Palo Alto, CA 94302.

Anchor Pad

Anchor Pad is a locking device to prevent the theft or unauthorized removal of typewriters, computers, and other such equipment. It's one of the nicest and most secure systems we have seen. It has a large self-adhesive mat with a grip equivalent to over three tons which is attached to a tamper-proof locking system with heavy steel rods and two pick-resistant locks. Unlike the kludgy systems used by most schools, Anchor Pad is attractive and secure. Anchor Pads cost about $85.



The Anchor Pad is a device which anchors an Apple or other computer. Shown in the photo is Bill Brock.

For more information, contact Anchor Pad, 1255 Post St., Suite 643-2, San Francisco, CA 94109. (415) 441-2593.

Southwestern Data Systems

Southwestern Data Systems was showing a line of "executive library cases" for carrying diskettes. These high-quality vinyl cases have one slot for each of twenty diskettes and, when the case is opened, the diskettes fan out so the user can easily select one of interest. Two sizes are available. for 5-1/4" diskettes ($19.95) and 8" diskettes ($26.95). For more information, contact Southwestern Data Systems, P.O. Box 582, Santee, CA 92071. (714) 562-3670.

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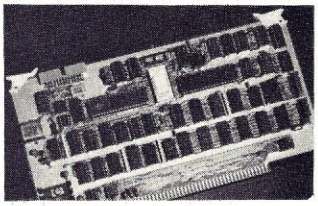

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Sorting and Filing Complex Alphanumeric Entries

Theodore C. Hines
and
Lois Winkel

"Straight" alphabetical sorting of complex alphanumeric information, such as entries for directories, indices, catalogs, and bibliographies, can produce peculiar arrangements of the entries—at least from the human user's point of view. A "straight" conventional computer sort arranges entries from left to right by the order of the collation sequence—the relative numeric values of the coding—of all the characters in the character set, including punctuation and spaces.

In the ASCII character set, for example, all lower-case letters sort after all upper-case letters, so that "analysis" would file after "Zebulon." Since numbers are, in effect, filed on from left to right, the following sequence is a likely result of an alphanumeric "straight" sort:

1
12
125
2

What all this implies is that sorting (the arrangement of entries by collation sequence) may be distinguished from filing (the arrangement of entries in a logical alphabetical order for human use). The larger the file and the more complex in form the entries to be dealt with, the more obvious this difference becomes.

One way of dealing with this situation involves the use of a program section prior to the sort which forms the sortkey to which the sort proper is actually applied. The sortkey must consist of characters which, when sorted on their collation sequence, will produce the arrangement by which we want the entries filed. After sorting, the sortkey is discarded and the original entries from which the sortkeys were derived are printed out.

Theodore C. Hines, Ph.D., Library Science/Educational Technology, University of North Carolina-Greensboro, Greensboro, NC 27412.

The simplest algorithm for forming sortkeys which produces helpful results in a majority of cases is to place characters taken one by one from the entry into the sortkey until there are no more characters or the sortkey is the desired length to discriminate properly among entries. If a lower-case character is encountered, it is changed to its upper-case equivalent before being placed in the sortkey. Any characters other than the space and upper- and lower-case letters are ignored: that is, not placed in the sortkey at all.

The sortkey must consist of characters which, when sorted on their collation sequence, will produce the arrangement by which we want the entries filed.

For most entries, this will produce a satisfactory word-by-word filing sequence. Anomalies occur, however. For instance, in filing such index entries as:

Sort algorithms 125
Sort algorithms 26

which should, after further massaging following the sort, produce a consolidated entry like this:

Sort algorithms 26, 125

would instead have the references out of logical order like this:

Sort algorithms 125, 26

This can be cured by adding a step to the sortkey which pads numbers with non-significant zeros to a length as long as (or longer than) the longest number to be encountered in data. This would make the sortkeys for index entries like those above (assuming the book indexed has fewer than 1000 pages) look like this:

SORT ALGORITHMS 026
SORT ALGORITHMS 125

which would file correctly.

This algorithm would not, however, be suitable as it stands if we wanted to file letter-by-letter, as is done in many encyclopedias, dictionaries, and glossaries. The difference may be made evident by the following examples.

In word-by-word filing of

New Haven
New York
Newark

the space precedes the letters of the alphabet. In letter-by-letter filing, the space is ignored and we get:

Newark
New Haven
New York.

Letter-by-letter arrangement may be achieved by omitting the space from the list of characters to be included in the sortkey—except that since letter-by-letter filing is seldom "straight" letter-by-letter, anomalies also arise, so that

"Medicine as a profession" would file between "Medicine" and "Medicine - Bibliography"

instead of, as would be more desirable, at the end of the sequence:

Medicine
Medicine - Bibliography
Medicine - History
. . . .
Medicine as a profession

As it happens, this particular anomaly can either be accepted as endurable, or cured by adding to the sortkey algorithm the provision that only the first of each series of spaces (omitting punctuation) is to be ignored, making the sortkeys of the examples look like this:

MEDICINE
MEDICINE BIBLIOGRAPHY
MEDICINE HISTORY
MEDICINEASAPROFESSION

which would accomplish the filing purpose.

Notice, however, that this particular algorithm would not work if two hyphens had been used to represent the dash.

Medicine—Bibliography

rather than a space-hyphen-space as in the examples above

All of this underscores the truth of Nikolaus Wirth's observation that: "Data Structures + Algorithms = Programs."

In order to achieve the filing order desired, it is necessary to consider the structure of the data, taken in conjunction with the sortkey algorithm, with as much care as that given to the algorithm itself.

Circumstances alter cases, of course, and special problems may arise when dealing with special types of data: chemical nomenclature, for example. By way of illustration of the way in which the sortkey algorithm must be considered in designing the data structure, it might be useful to give a few of the styling (data structure) rules used by us for entries for book indices. In this instance, it is assumed that word-by-word filing is what is wanted.

The definite and indefinite articles (a, an, the) are omitted at the beginning of the titles of books and journal articles. It would be possible, of course, to write a program loop to ignore initial articles in forming the sortkey, but omitting such initial articles is common practice in indices and is desirable to keep the sortkey formation algorithm as simple as possible.

As noted above, the use of the space-hyphen-space to represent the dash produces desirable subordination. Similarly, the parts of names of corporate bodies are separated by a period and two spaces for the same reason, so that

Treasury Department. Office of the Secretary

will file properly ahead of

Treasury Department bulletins

By using three spaces to precede page numbers and four spaces to precede cross-references, these entries will file in the preferred order by using sortkeys formed by our simplified algorithm.

Cats SEE ALSO Dogs
Cats 25-26
Cats - Veterinary medicine 45

These data structure rules are simply examples to indicate the kinds of considerations which arise.

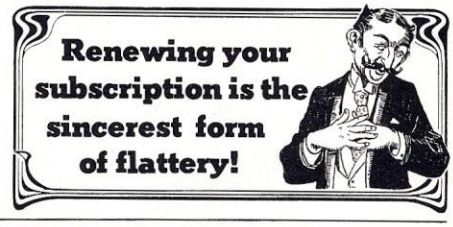
As computers, and especially microcomputers, are used more and more for larger and more complex information and word-processing tasks, programmers will have to pay increasing attention to sortkey formation and data structure design for sorting purposes. We hope this article will prove useful as an introduction to this type of analysis. □

References

1) Wirth, Niklaus, *Algorithms + Data Structures = Programs*, Prentice Hall, Englewood Cliffs, NJ, 1976. (Note the sorting problems which might be posed by this title)

2) Hines, Theodore C. and Hines, Jessica L., *Computer Filing of Index, Bibliographic, and Catalog Entries*, Bro-Dart Foundation, Newark, NJ, 1966.

3) Harris, Jessica L., *Subject Analysis: Computer Implications of Rigorous Definition*, Scarecrow Press, Metuchen, NJ, 1970.



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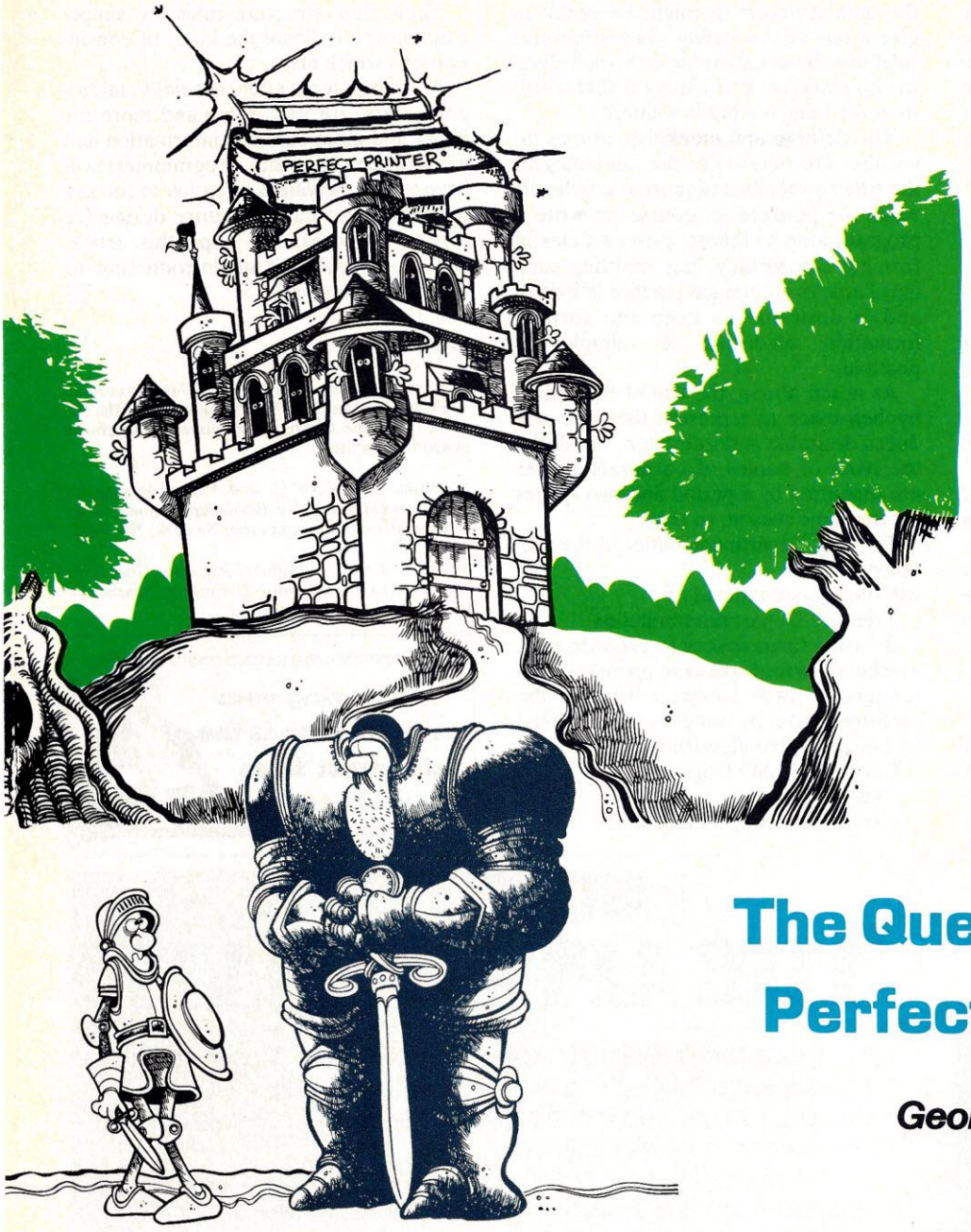

The Quest for the Perfect Printer

George Blank

The right printer is easier to recognize than the Holy Grail. During my three years on a fruitless quest, dozens of people have described it to me. It is compact, lightweight, fast, quiet, reliable, easy to service, easy to load with paper, uses plain paper of various widths with or without holes along the sides, has typewriter quality print, uses cheap ribbons, and costs less than $500.

During the first score of months on my quest, I believed that it also had excellent graphics. I have since learned that this is not so. There is a fundamental incompatibility between quality graphics and a printer that will be used for correspondence. A high resolution graphics printer, such as Integral Data Systems' excellent later models, must have tractor feed for precise registration. Every dot must be printed in exactly the right place. The tractor feed is the most expensive part of a good graphics printer. But a correspondence printer must accept ordinary stationery, typewriter paper, and even envelopes. Tractor feed stationery is hard to get, expensive, and has annoying unfinished edges when you tear off edges. I suppose tractor feed envelopes are available somewhere, but are even more difficult to find.

I am adamant about the price. I see no reason why a decent printer should cost more than the computer to which it is connected.

The print quality may or may not be negotiable. I have no quarrel with attractive high density dot matrix characters like those of the Epson MX-80 or the Centronics 737 printers for 98% of my printer use. But it does seem tacky to address Christmas Cards or apply for a job using dot matrix print.

In my opinion, one thing that is absolutely non-negotiable is true descenders on the lower case characters. This means that the tails on lower case g, j, p, q, and y must extend below the line of other letters.

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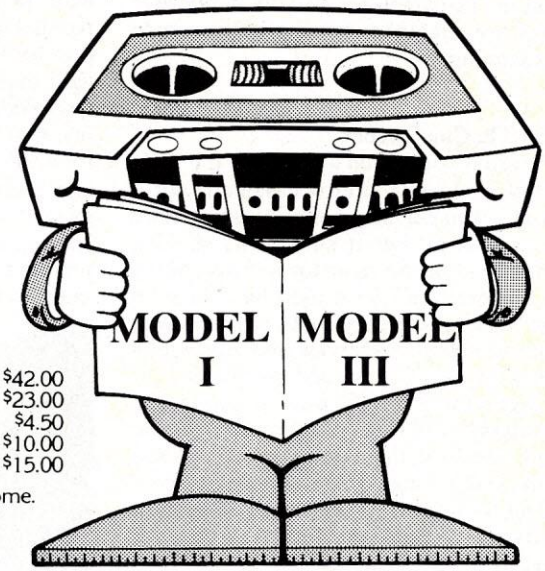

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Perfect Printer, continued...

I have talked to more than a dozen printer manufacturers who have told me that the public doesn't demand descenders. My personal experience does not support that view. For I have talked to well over a hundred people looking for printers, and quality lower case type was high on everyone's preference list. Any printer without descenders is unacceptable to me, and the manufacturer who doesn't believe they are necessary may be in for a rude awakening.

The Tin Cup Theory

Even if you are on a quest for the Holy Grail, you must stop occasionally for a drink. A tin cup may not be as satisfactory as the Grail, but it sure beats sticking your head in the river for a drink. Many of the printers I have used have been in the "tin cup" category, and I have received varying degrees of service and satisfaction from them as I continued my quest.

Actually, I would like to group the printers I have used into three categories, and compare them to tin cups, plastic cups, and sterling silver goblets. My primary needs for printers fall into three categories: software development, normal writing, and quality correspondence.

Printers that are satisfactory for software development may be compared to a tin cup. They are for my personal use only, get heavy use, and print quality, perhaps even true descenders, can be sacrificed for low cost, reliability or high speed. Printers that are acceptable for everyday writing, including letters and magazine articles, can be compared to the plastic dinnerware that many people use for family dining. The output of such printers must be read by other people, and while typewriter quality is not a must, it should come close. The printers that I must currently use for important correspondence can be compared to silver goblets. While they are necessary when you are sending resumes to the Fortune 500 asking for a position as Chairman of the Board, they tend to be oversized, overpriced, and hard to maintain. Personally, I never liked polishing silver.

My perfect printer does not fall into any of these categories. I would rather compare it to an ordinary china cup. Only a china cup does a good job of keeping my coffee warm without adding any unpleasant tastes or burning my fingers, and while I may use a cup made out of tin, plastic, styrofoam, glass, pewter, or even silver, it is not by choice.

"Tin Cup" Printers

In the tin cup category of printers I have used, I include the Radio Shack Quick Printer II, the Eaton LRC 7000+ and the Centronics 730 and 779. Since the Centronics 730 is so close in price and features to the 737, which belongs in the next category, I will not describe it. Anyone to whom the 730 appeals should get the 737.

Radio Shack Quick Printer II

This delightful little printer has three main strengths. It is cheap, very portable, and eligible for Radio Shack service. I know of no other printer that sells for less than $220 brand new and comes equipped with an RS-232 serial and a Centronics parallel port, not to mention a special port for the TRS-80 bus. It is so small and light that I was able to carry my TRS-80 keyboard, cassette recorder, and the printer in a small suitcase, substituting the printer for a video monitor. It has very few parts, and I never had any trouble with it. But even if it fails, Radio Shack offers the least expensive and most readily available printer servicing I know about. It is very quiet and the paper is reasonably cheap.

There are also significant drawbacks to this printer. It uses hard-to-read electrostatic paper, and the print width on the paper is only 2". A long listing is sheer murder to read, and since it only prints 32 characters per line, I would not want to use it for assembly language programming. Also, the paper just sits in a groove, and I have often sent it unrolling across the floor when moving the printer from place to place.

The Eaton LRC 7000 (Atari 820)

This is quite a step up from the Quick Printer II for only a little more money. While it lists for $389, it is frequently discounted, and often sells for less than $300. It takes an ordinary cheap typewriter ribbon and plain paper, though you must use 4 1/4" wide roll paper. While it normally comes configured for 40 characters per line, there is a version, the 7000+, with a 64-character line that is ideal for use with the TRS-80. The mechanism is very rugged,

ATARI 820 (Eaton LRC)
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ

and was used for years in cash registers, so service should not be frequent. A serial version of the same printer, with a smart controller for the Atari Bus, is sold as the Atari 820 printer. The newly announced price is $299.95. The print is easy to read, and is a good cheap printer for software development work.

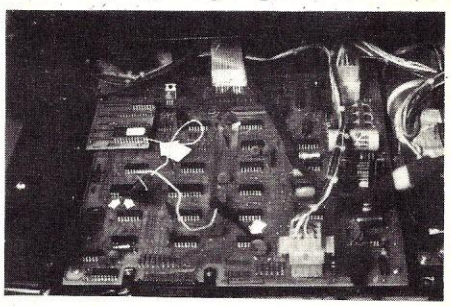
The Eaton printers have three serious drawbacks. The narrow paper width is insufficient for many uses, it is quite noisy, and it is very slow. On short listings, the speed is acceptable, but on long listings, the mechanism heats up and must stop to cool off. When this first happened to me, I thought the printer was broken, but later realized that it was normal for it to print a couple of lines, cool off for 10 seconds, print a couple more lines, cool off again, etc. It is also significantly larger and heavier than the Quick Printer II, though smaller than the rest of the printers to be discussed.

The Centronics 779 (Radio Shack Line Printer I)

This rugged, dependable old timer is the pack mule of the computer industry. The list price is around $1395, but it is almost always discounted, and is frequently available used. Radio Shack seems to be

Centronics 779 (Radio Shack Line Printer I)
with Service Technologies lower case kit
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ

closing out the similar 781 (same printer without adjustable character size) at $789, and Radio Shack service is much cheaper and easier to find than Centronics service. It does not come with lower case, but several companies, including Service Technologies (32 Nightingale Rd., Nashua,



The Service Technologies lower case modification (small board in upper left) installed in a Centronics 779 printer.

Find Your Way Around The New Apple® DOS With The Dakin5® Programming Aids 3.3©

Dakin5 Corporation, a Colorado software house, is making available to the public 12 utility programs on one 16 sector diskette, utilizing the new Apple DOS 3.3, which provides 23% more storage.

These menu-driven utilities will facilitate the development of your own microcomputer programs.

All of the **Dakin5 Programming Aids 3.3** programs are also compatible with the Corvus Disk Drive system.

This 12-in-1 set of utility programs accomplishes the following:

The Lister sends BASIC programs to the printer to be listed, utilizing the full line capacity of the printer. Pagination and page headings, including program name and date, are also provided as additional options.

The Line Cross Reference produces a display or a printed listing of all lines referenced by GOTO, THEN, GOSUB, LIST or RUN statements in an Applesoft BASIC program. Cross-referencing of most programs is done in a few seconds. An option allows you to print only the line numbers referenced in GOSUB statements.

The Variable Cross Reference creates a display or a printed listing of all variable names used in an Applesoft BASIC program, showing all line numbers where a given variable name is used.

The Peeker displays or prints either all or selected records from a text file.

The Patcher allows you to display any sector of a given file or program, and then to update any data within that sector. Another option permits you to specify the sector you wish to update such as directory sectors and sectors occupied by DOS.

The Copier copies absolutely ANY type of file or program on a normally formatted diskette from one diskette to another. The name of the program or file is the ONLY information needed.

The Calculator adds, subtracts, multiplies and divides very large numbers using numeric string data. The Calculator subroutine (using twenty place accuracy) is written in Assembler code, and runs much faster than an equivalent BASIC subroutine.

The Diskette Copy is a diskette-to-diskette copy program that does more than just copy. First, the program verifies the input. Then it formats an output disk, copies each track, and checks that the output matches the input. Additional options allow you to either initialize a diskette without DOS, or to create a copy without DOS, thereby increasing storage by 32 sectors. You may even create a copy with a different volume number than the original.

The Array Editor is a simple word processor that allows you to create, modify, print and save your own text or EXEC files.

The Screen Printer permits contents of the text screen to be sent to the printer at any time the keyboard is active (i.e. the cursor is visible). This Screen Printer program remains in effect until you press RESET or "reboot" the system.

The Prompter is a data entry subroutine that handles both string and numeric data. You have the option of using commas, decimal points and leading zeros with right-justified numerics. Alphanumeric data is left justified with trailing spaces added as required. With the Prompter you are also able to specify maximum field length to prevent overflow in both numeric and alphanumeric fields. You can even define your own set of valid characters.

The Cruncher removes REM statements, unreferenced (dead) code, and compresses code in Applesoft programs. This will increase the speed of your programs; memory and disk space savings could be more than 45%.

Many of these utility programs have been developed and tested for in-house use while producing The Controller™ business package for Apple Computer Inc.

Each programming aids package includes a program diskette and very complete documentation, all attractively packaged in a padded, blue print vinyl 3-hole notebook with silver lettering. An identifying tab separates each program for convenient reference.

See your Apple dealer or contact Dakin5 Corporation, P.O. Box 21187, Denver, Colorado 80221. Telephone: 800-525-0463. Visa or MC welcome.

DAKIN5 CORPORATION

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CIRCLE 125 ON READER SERVICE CARD

Comparison Chart of 35 Popular Printers

Printer	Reviewed	Price	Paper	Print Mode	Feed	Columns	Graphics	Interfaces	Lower Case
Anadex DP-9501	6/81	$1595	Plain	Dot Matrix	T	80-220	Dot	P	Descenders
Apple Silentype (Trendcom 200)		$ 635	Thermal	Dot Matrix	R	40	Dot	Apple	Raised
Atari 820 (Eaton LRC)	7/81	$ 299	Plain	Dot Matrix	R	40	Partial	A	Raised
Atari 825 (Centronics 737)	4/81 7/81	$ 799	Plain	Dot Matrix	L,P,R,S	72-132	No	A	Descenders
Base 2 800 MST	2/81	$ 699	Plain	Dot Matrix	T	64-132	Dot	C P S	Raised
Centronics 737	4/81 7/81	$ 995	Plain	Dot Matrix	L,P,R,S	72-132	No	P	Descenders
Centronics 779 (781)	6/80 7/81	varies	Plain	Dot Matrix	L,R,S,T	64-132	No	P	(Need Kit)
Commodore CBM 2022	5/80 12/80	$ 995	Plain	Dot Matrix	T	80	Character	C	Raised
Comprint 912	6/80	$ 659	Elect.	Dot Matrix	R	80	No	P,S	Descenders
Diablo 1640		$3195	Plain	Daisy Wheel	L,R,S,T	132	No	S	Typewriter
Eaton LRC	7/81	$ 389	Plain	Dot Matrix	R	40 (64)	No	P S	Raised
Escon E-A Interface	6/80	$ 675	(Kit for IBM Selectric Typewriter)				No	C P S	Typewriter
Epson MX-80	7/81	$ 645	Plain	Dot Matrix	P	80-132	Character	P	Descenders
Heath H-14	6/80	$ 625	Plain	Dot Matrix	P	80	No	S	Raised
Howard Industries Typrinter 221		$2850	Plain	Type Ball	S	132	No	S	Typewriter
Integral Data 460		$1395	Plain	Dot Matrix	T	80-132	Dot	P,S	Descenders
Integral Data 560		$1695	Plain	Dot Matrix	T	80-132	Dot	P,S	Descenders
Malibu 160	12/79 6/80	$2395	Plain	Dot Matrix	T	80	Dot	S	Descenders
Micro Computer Devices Selectraterm	12/79 6/80	$2495	Plain	Type Ball	L,S,T	132	No	P,S	Typewriter
Micro Peripherals Inc. 88G	4/81	$ 749	Plain	Dot Matrix	L,R,S,T	80-132	Dot	A	Raised
NEC Spinwriter	7/81	$3055	Plain	Thimble	L,R,S,T	132	No	P,S	Typewriter
Okidata Microline 82	7/81	$ 649	Plain	Dot Matrix	F,P	132	Block	P,S	Raised
Qume Sprint 5	12/79 6/80	$2995	Plain	Daisy Wheel	L,R,S,T	132	No	P,S	Typewriter
Radio Shack Daisy Wheel II		$1960	Plain	Daisy Wheel	L,S,T	132	No	P	Typewriter
Radio Shack Line Printer I	6/80 7/81	$1395	Plain	Dot Matrix	L,R,S,T	132	No	P	(Need Kit)
Radio Shack Line Printer IV	4/81 7/81	$ 995	Plain	Dot Matrix	L,P,R,S	80-132	Dot	A,P,T	Descenders
Radio Shack Line Printer VI	2/81	$1160	Plain	Dot Matrix	L,P,R,S	80-132	Character	P	Raised
Radio Shack Line Printer VII		$ 399	Plain	Dot Matrix	P	80	No	P	Raised
Radio Shack Quick Printer II	11/79 7/81	$ 219	Elect.	Dot Matrix	R	16,32	No	P,S	Raised
Rochester Data Dynatyper	7/81	$ 499	(Attaches to electric typewriter)				No	C,P,S	Typewriter
Starwriter Daisy Wheel	7/81	$1795	Plain	Daisy Wheel	L,S	132	No	P,S	Typewriter
Teletype Model 43	12/79 6/80	$1095	Plain	Dot Matrix	T	132	No	S	Descenders
Texas Instruments 810	12/79 6/80	$1895	Plain	Dot Matrix	T	132	No	P,S	Optional
Trendcom 100	6/80	$ 375	Thermal	Dot Matrix	R	40	Dot (Opt)	P	Raised
Vista V300 - 25	7/81	$1895	Plain	Daisy Wheel	L,S	132	No	P,S	Typewriter

KEY: **Paper Feed** (L) Labels (P) Pin Feed (R) Roll (S) Sheets (T) Tractor Feed (F) Friction
Interfaces Available (A) Atari (C) CBM/PET (IEEE 488) (P) Centronics Parallel (TRS-80, Apple) (S) Serial

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ATARI

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ADVENTURE INTERNATIONAL			
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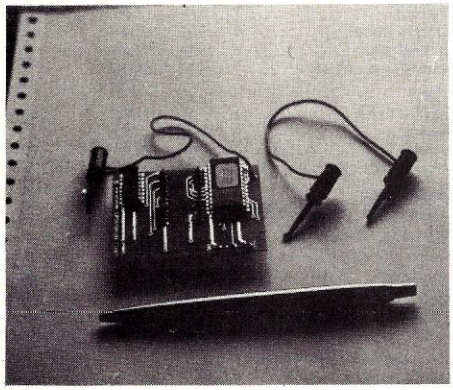
CIRCLE 158 ON READER SERVICE CARD

NH 03062, $125) and Digital Systems Engineering (12503 Kings Lake Dr., Reston VA 22091, $95 and $135) offer modification kits. I used the Service Technologies kit and installed it in five minutes using only a screwdriver.

Since these printers can have either platen feed (like a typewriter) or tractor feed, they are very flexible, although the platen feed does not seem to grip uniformly, particularly on small labels. The print speed is relatively fast, and I have seen about a dozen of these in heavy use over a period of years, with few service problems. If I could get true descenders on the lower case characters, this would come quite close to my ideal printer. As it is, I do not object strongly to letters and articles done on the 779 printer. It is great for line listings, whether Basic or Assembly language.



The Service Technologies 779 lower case conversion kit. (Pen is not included.)

In addition to the lack of true descenders and the poor platen grip, this printer is moderately noisy, heavy, and takes up a great deal of room, but that is not enough to keeep it from being my favorite "tin cup" printer.

Moving up to Melmac

There are two printers in the "plastic cup" category, the Epson MX-80 and the Centronics 737, both of which are distinguished by "correspondence" quality print with true descenders on lower case. They use a high density dot matrix print that is close enough to typewriter quality for many uses. They are also small and lightweight. At the moment, these two printers come closer to the ideal printer for home use than anything else available.

The Epson MX-80

This is my first choice among currently available printers. I have used one at home, and we have had three at Creative Computing in almost constant use for nearly a year. One of them is connected to our typesetting system, and nearly every article, book, and piece of software documentation we have printed since July of last year has

```
Epson MX - 80
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
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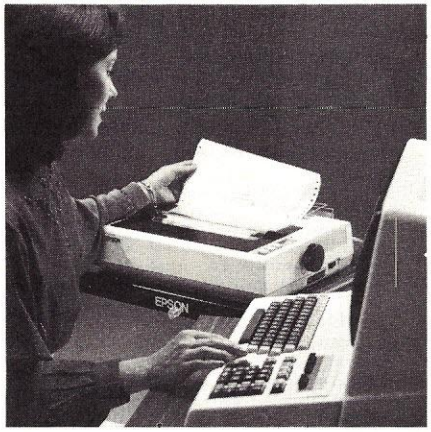
been printed on it for proofreading—often several times. The only problem we have experienced has been an occasional paper jam caused by paper catching on the wire rack that supports the paper coming out of the printer. This can be corrected if you catch it as soon as it happens, but it does mean that one can't leave the printer unattended when printing out a long listing.

The MX-80 is quiet, rugged, moderately fast, has attractive print, and even has a good price. While it lists for $645, I have frequently seen it discounted. One dealer at the West Coast Computer Faire was selling it at a price so low that I don't dare print it. He could hardly keep up with the demand.

The only real drawbacks to the MX-80 are the lack of true typewriter quality print and its limitation to pin feed only. I cannot give an answer about service availablity or price, for though I have used four of them extensively, the most drastic service ever needed has been a change of ribbon or addition of more



paper. The company is working on a platen feed model which they hoped to demonstrate at the National Computer Conference in May and have available this summer. The price has not been determined at this writing, but most people who are buying a printer will want to check this one out.

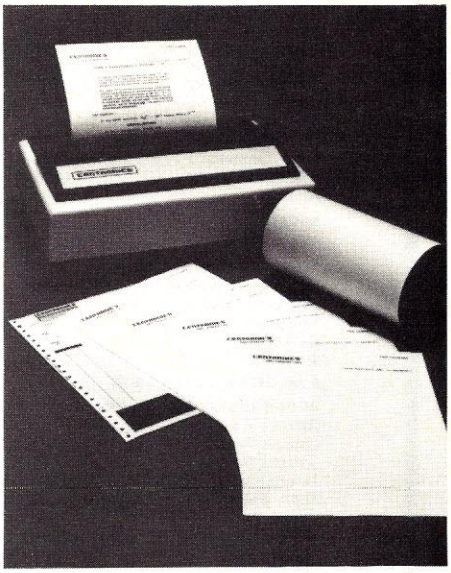
The Centronics 737
(Atari 825, Radio Shack Line Printer IV)

This thousand dollar printer has even nicer print quality than the MX-80, particularly in its condensed and proportional type modes. It will handle both pin feed and plain paper. With the right software (currently unavailable, unless you use control characters from your own Basic program), it will offer proportional

```
ATARI 825 (Centronics 737)
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

spacing, underlining, superscripts and subscripts. It will print up to 132 columns, and the Centronics version is often discounted well below the $995 list price. Here again, I recommend the Radio Shack version for the service, but if you can get good service at a computer store on another version, buy it there.

I think service is more important on this printer than any of the others I have mentioned so far. I have experienced problems with several of them, usually with the print head carrier traveling over to the right and locking, or burning up the print head. In addition, I find the paper difficult to feed in, and have had



frequent paper jams, which are sometimes difficult to clear. They are usually caused by the paper folding over and feeding back into the paper feed. I don't like the design of the bus connector, because you don't know which way to plug in the cable until you try a "smoke test." I haven't damaged a printer by plugging the cable in wrong, but I have burned my fingers unplugging the connector after discovering it was upside down.

The platen is made of hard plastic with spaced ridges and does not hold narrow forms or labels well. The pin feed mechanism is not adjustable, and is set up for 9 1/2" paper. I have been told that the most serious problems, locking up and the burned up heads, have been corrected in later models, but I would insist on an iron-clad guarantee before buying one of these printers. I can say that our Atari 825 printer, about a month old, has given us no trouble at all.

Sterling Silver—The Real Thing?

True letter-quality printers tend to be expensive, large, heavy, and prone to servicing problems. Let us consider the best first, and after recognizing that only businessmen (it is tax deductible for them) and the independently wealthy can afford it, move on to the others.

The NEC Spinwriter

The list price on this majestic printer is indeed royal: from $3,055 to $4,255 depending on the options. It is much like a typewriter, with fixed width print characters, 132 columns across at 10 characters per inch. It is rugged, durable, and for a letter quality printer, reasonably fast at 55 characters per second. Most of my line listings printed in "Outpost: Atari" before

I moved to New Jersey in March were done on this printer, and the print quality is excellent. I have experience with only one of them, but it was in frequent use for more than a year without any problems except a small crack in the outer case when somebody dropped it down the stairs.

It is big, heavy, and noisy. I wouldn't allow it in my office because of the noise, but always took my important correspondence over to it. Not only is it expensive to buy, but the ribbons are costly as well. With a quality platen and adjustable tractors, it is a very versatile printer. I do think it has too many features. It was a nuisance trying to defeat the paper empty indicators when I just wanted to print an address on an envelope. However, if I could afford any printer I wanted, it would be a Spinwriter.

The Vista 25 CPS Printer (Starwriter Daisy Wheel)

The printer that now sits in my office is an $1895 Vista. My limited experience with it has not been entirely satisfactory. Though I have had it for over a month, I have been unable, despite repeated calls, to get a manual for it. This is a serious problem, for it has many built-in features controlled by software control codes, and without a manual you don't even know what they are, much less how to work them. In addition, it is out of adjustment, and does vertical line feeds unevenly, leaving a line of extra space every few lines.

```
Vista V300-25
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
This is the Vista V300-25 using
Superscript's Diablo printer
driver with underlining,
superscripts, subscripts,
Boldface, slash Ø, elite spacing,
and pica spacing.
```

The specifications are quite impressive. It has high quality print, and uses standard print wheels. It will give variable line heights, boldface, subscripts and superscripts, variable spacing, and probably a bunch of other features that I would know about if I had a manual. It is significantly quieter than the Spinwriter, though less than half as fast at 25 characters per second. There is also a 45 character per second model available.

The same printer, which is made in Japan, is available as the Starwriter Daisy Wheel Printer. I think that this would probably be a good buy if you could get it from a dealer that would stand behind it and service it at a reasonable price, but it is definitely not the kind of printer to buy through the mail.

During the last 15 months, Creative Computing has reviewed many other printers. All of these printers plus those above are listed in the chart. Back issues with these reviews are available for $2.50 each postpaid or $2.00 each for 3 or more issues. □

"HOW TWO" information!

TRS-80 Disk & Other Mysteries is the definitive **fixit** book for disk users. More than 130 pages of easy to read, entertaining and immensely useful information - find out how to recover disk files, the layout of information on disks, memory maps, problem solutions ... the list goes on!

Many readers have saved days of work by recreating disk files that were unreadable. With more than 14,000 copies sold so far, **TRS-80 Disk** & Other Mysteries has received favourable reviews in several magazines. Yours for only **$22.50** (plus $1.50 shipping. CA residents add $1.35 sales tax).

Microsoft BASIC Decoded & Other Mysteries is the definative guide to your Level II ROMs. With more than 7,000 lines of detailed comments, and 6 additional chapters packed with information, it is easily the biggest and best book about the Level II ROMs available.

Written by James Farvour, the comment section took more than a year to finish - it even includes the changes for the latest ROM sets. Edited by Jim Perry, the founding editor of 80 Microcomputing, the text and comments are understandable.

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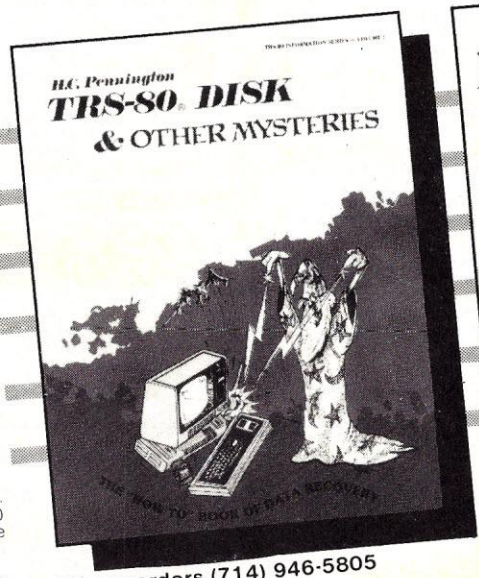

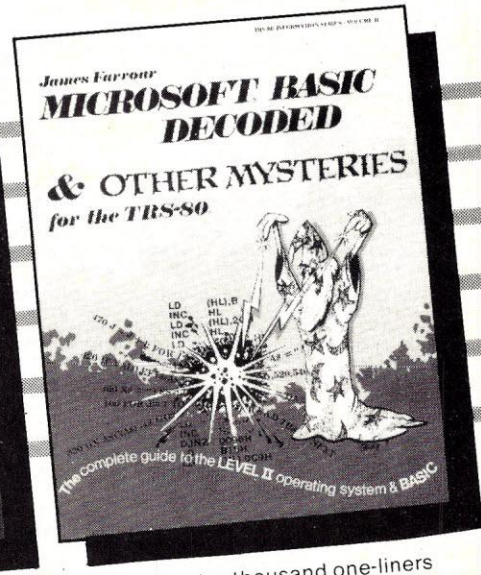
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CARD GAMES

BRIDGE 2.0 (Available for all computers) — **Price: $17.95 Cassette/$21.95 Diskette**
An all-inclusive version of this most popular of card games. This program both BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high, the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice. See the software review in 80 Software Critique.

HEARTS 1.5 (Available for all computers) — **Price: $15.95 Cassette/$19.95 Diskette**
An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with hard-to-beat playing strategies. HEARTS 1.5 is an ideal game for introducing the uninitiated (your spouse) to computers. See the software review in 80 Software Critique.

STUD POKER (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic gambler's card game. The computer deals the cards one at a time and you (and the computer) bet on what you see. The computer does not cheat and *usually* bets the odds. However, it sometimes bluffs! Also included is a five card draw poker betting practice program. This package will run on a 16K ATARI. Color, graphics, sound.

POKER PARTY (Available for all computers) — **Price: $17.95 Cassette/$21.95 Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple Cassette and diskette versions require a 32 K (or larger) Apple II.

CRIBBAGE 2.0 (TRS-80 only) — **Price: $14.95 Cassette/$18.95 Diskette**
This is simply the best cribbage game available. It is an excellent program for the cribbage player in search of a worthy opponent as well as for the novice wishing to improve his game. The graphics are superb and assembly language routines provide rapid execution. See the software review in 80 Software Critique.

THOUGHT PROVOKERS

FLIGHT SIMULATOR (Available for all computers) — **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS.

VALDEZ (Available for all computers) — **Price: $15.95 Cassette/$19.95 Diskette**
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software review in 80 Software Critique.

BACKGAMMON 2.0 (North Star only) — **Price: $18.95**
This full version of the classic board game uses clever tactics to insure a challenging game. The board printout assumes the use of a 16 × 64 video display. You will find BACKGAMMON 2.0 to be an excellent learning device as well as a tough opponent.

NOMINOES JIGSAW (Atari, Apple and TRS-80 only) — **Price: $16.95 Cassette/$20.95 Diskette**
A jigsaw puzzle on your computer! Complete the puzzle by selecting your pieces from a table consisting of 60 different shapes. NOMINOES JIGSAW is a virtuoso programming effort. The graphics are superlative and the puzzle will challenge you with its three levels of difficulty. Scoring is based upon the number of guesses taken and by the difficulty of the board set-up.

CHESS MASTER (North Star and TRS-80 only) — **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users.

MONARCH (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy.

CHOMP-OTHELLO (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
CHOMP-OTHELLO? It's really two challenging games in one. CHOMP is similar in concept to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. OTHELLO is the popular board game set to fully utilize the Atari's graphics capability. It is also very hard to beat! This package will run on a 16K system.

AND MORE...

STARTREK 3.2 (Available for all computers) — **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

BLACK HOLE (Apple only) — **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

SPACE TILT (Apple only) — **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

MOVING MAZE (Apple only) — **Price: $10.95 Cassette/$14.95 Diskette**
MOVING MAZE employs the games paddles to direct a puck from one side of a maze to the other. However, the maze is dynamically (and randomly) built and is continually being modified. The objective is to cross the maze without touching (or being hit by) a wall. Scoring is by an elapsed time indicator, and three levels of play are provided.

ALPHA FIGHTER (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score!

INTRUDER ALERT (Atari only) — **Price: $16.95 Cassette/$20.95 Diskette**
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

GIANT SLALOM (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
This real-time action game is guaranteed addictive! Use the joystick to control your path through slalom courses consisting of both open and closed gates. Choose from different levels of difficulty, race against other players or simply take practice runs against the clock. GIANT SLALOM will run on 16K systems.

GAMES PACK I (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

MOON PROBE (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star only) — **Price: $21.95**
At last! A comprehensive Adventure game for North Star. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 40 countries). During the past two years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique and A.N.A.L.O.G. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

**ATARI, PET, TRS-80, NORTHSTAR, CP/M and IBM are registered tradenames and/or trademarks.*

***TRS-80 diskettes are not supplied with DOS or BASIC.*

BUSINESS and UTILITIES

MAIL LIST 2.2 (Apple, Atari and North Star diskette only) **Price: $34.95**

This program is unmatched in its ability to store a maximum number of addresses on one diskette (minimum of 1100 per diskette, more than 2200 for "double density" systems!). Its many features include alphabetic and zip code sorting, label printing, merging of files and a unique keyword seeking routine which retrieves entries by a virtually limitless selection of user defined codes. A very valuable program!

FORM LETTER SYSTEM (FLS) (Apple and North Star diskette only) **Price: $21.95**

Use FLS to create and edit form letters and address lists. Form letters are produced by automatically inserting each address into a predetermined portion of your letter. FLS is completely compatible with MAIL LIST 2.2, which may be used to manage your address files.

FLS and MAIL LIST 2.2 are available as a combined package for $49.95.

PERSONAL FINANCE SYSTEM (Atari and North Star only) **Price: $34.95 Diskette**

PFS is a single disk menu oriented system composed of 10 programs designed to organize and simplify your personal finances. Features include a 300 transaction capacity; fast access; 26 optional user codes; data retrieval by month, code or payee; optional printing of reports; checkbook balancing; bar graph plotting and more. Also provided on the diskette is Atari and North Star DOS 2.

THE COMMUNICATOR (Atari only) **Price: 49.95 Diskette**

This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

DYNACOMP also supplies THE COMMUNICATOR with an Atari 830 modem for a combined price of $219.95. The modem is available separately for $189.95.

TEXT EDITOR II (CP/M) **Price: $29.95 Diskette/$33.45 Disk**

This is the second release version of DYNACOMP's popular TEXT EDITOR I and contains many new features. With TEXT EDITOR II you may build text files in chunks and assemble them for later display. Blocks of text may be appended, inserted or deleted. Files may be saved on disk/diskette in right justified/centered format to be later printed by either TEXT EDITOR II or the CP/M ED facility. Futher, ASCII CP/M files (including BASIC and assembly language programs) may be read by the editor and processed. In fact, text files can be built using ED and later formatted using TEXT EDITOR II. All in all, TEXT EDITOR II is an inexpensive, easy to use, but very flexible editing system.

COMPARE (North Star only) **Price: $12.95**

COMPARE is a single disk utility software package which compares two BASIC programs and displays the file sizes of the programs in bytes, the lengths in terms of the number of statement lines, and the line numbers at which various listed differences occur. COMPARE permits the user to examine versions of his software to verify which are the more current, and to clearly identify the changes made during development.

COMPRESS (North Star only) **Price: $12.95**

COMPRESS is a single-disk utility program which removes all unnecessary spaces and (optionally) REMark statements from North Star BASIC programs. The source file is processed one line at a time, thus permitting very large programs to be compressed using only a small amount of computer memory. File compressions of 20-50% are commonly achieved.

DFILE (North Star only) **Price: $19.95**

This handy program allows North Star users to maintain a specialized data base of all files and programs in the stack of disks which invariably accumulates. DFILE is easy to set up and use. It will organize your disks to provide efficient locating of the desired file or program.

FINDIT (North Star only) **Price: $19.95**

This is a three-in-one program which maintains information accessible by keywords of three types: Personal (eg: last name), Commercial (eg: plumbers) and Reference (eg: magazine articles, record albums, etc). In addition to keyword searches, there are birthday, anniversary and appointment searches for the personal records and appointment searches for the commercial records. Reference records are accessed by a single keyword or by cross-referencing two or three keywords.

GRAFIX (TRS-80 only) **Price: $14.95 Cassette/$18.95 Diskette**

This unique program allows you to easily create graphics directly from the keyboard. You "draw" your figure using the program's extensive cursor controls. Once the figure is made, it is automatically appended to your BASIC program as a string variable. Draw a "happy face", call it H$ and then print it from your program using PRINT H$! This is a very easy way to create and save graphics.

TIDY (TRS-80 only) **Price: $10.95 Cassette/$14.95 Diskette**

TIDY is an assembly language program which allows you to renumber the lines in your BASIC programs. TIDY also removes unnecessary spaces and REMark statements. The result is a compacted BASIC program which uses much less memory space and executes significantly faster. Once loaded, TIDY remains in memory; you may load any number of BASIC programs without having to reload TIDY!

EDUCATION

HODGE PODGE (Apple only, 48K Integer BASIC) **Price: $19.95 Cassette/$23.95 Diskette**

Let HODGE PODGE be your child's baby sitter. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 9. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. HODGE PODGE requires a 48K Apple running with Integer BASIC.

TEACHER'S PET I (Available for all computers) **Price: $11.95 Cassette/$15.95 Diskette**

This is the first of DYNACOMP's educational packages. Primarily intended for pre-school to grade 3, TEACHER'S PET provides the young student with counting practice, letter-word recognition and three levels of math skill exercises.

MORSE CODE TRAINER (TRS-80 only) **Price: $12.95 Cassette/$16.95 Diskette**

MORSE CODE TRAINER is designed to develop and improve your speed and accuracy in deciphering Morse Code. As such, MCT is an ideal software package for FCC test practice. The code sound is obtained through the earphone jack of any standard cassette recorder. You may choose the pitch of the tones as well as the word rate. Also, various modes of operation are available including number, punctuation and alphabet tests, as well as the keying of your own message. A very effective way to learn code!

MISCELLANEOUS

CRYSTALS (Atari only) **Price: $ 9.95 Cassette/$13.95 Diskette**

A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY

DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain several program and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.

Price: $9.95 each/$7.95 each (4 or more)
The complete collection may be purchased for $149.95

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM format) 8" CP/M floppy disks for systems running under MBASIC.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) **Price: $29.95 Cassette/$33.95 Diskette**

DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. The filter forms are subsequently converted into non-recursive convolution coefficients which permit rapid data processing. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) **Price: $14.95 Cassette/$18.95 Diskette**

This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) **Price: $16.95 Cassette/$20.95 Diskette**

Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) **Price: $19.95 Cassette/$23.95 Diskette**

This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**

HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $44.95 (three cassettes) and $56.95 (three diskettes).

REGRESSION I (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**

REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data and curve plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**

PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data and results may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**

MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $49.95 (three cassettes) or $61.95 (three diskettes).

ANOVA (Available for all computers) **Price: $39.95 Cassette/$43.95 Diskette**

In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volume I (Not available for Atari)

DYNACOMP is the exclusive distributor for the software keyed to the popular text *BASIC Scientific Subroutines, Volume I* by F. Ruckdeschel (see the BYTE/McGraw-Hill advertisement in BYTE magazine, January 1981). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Collection #1: Chapters 2 and 3: Data and function plotting, complex variables
Collection #2: Chapter 4: Matrix and vector operations
Collection #3: Chapters 5 and 6: Random number generators, series approximations

Price per collection: $14.95 Cassette/$18.95 Diskette
All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).

Because the text is a vital part of the documentation, *BASIC Scientific Subroutines, Volume I* is available from DYNACOMP for $19.95 plus 75¢ postage and handling.

ROOTS (Available for all computers) **Price $10.95 Cassette/$14.95 Diskette**

In a nutshell, ROOTS simultaneously determines all the zeroes of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. No initial guesses are required as input, and the calculated roots are substituted back into the polynomial and the residuals displayed.

LOGIC SIMULATOR (Apple only; 48K RAM) **Price: $24.95 Cassette/$28.95 Diskette**

With LOGIC SIMULATOR you may easily test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. The response of the system is available every clock cycle. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. At the user's option, a timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

LOGIC DESIGNER (North Star only) **Price: $34.95 Diskette**

LOGIC DESIGNER is an exceptional Computer Aided Design (CAD) program. With it you may convert a large and complicated digitial truth table (the functional specification) into an optimized Boolean logic equation. This equation may then be *easily* converted into a circuit design using either NAND or AND/OR gates. Operationally, LOGIC DESIGNER is composed of a BASIC program which calls in a machine language routine to reduce execution time. Example: For a 7 variable by 127 line table, the processing time is only two minutes. LOGIC DESIGNER is clearly a fast and powerful tool for building digital circuitry.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card.

Shipping and Handling Charges
Within North America: Add $1.00
Outside North America: Add 10% (Air Mail)

Delivery
All orders (excluding books) are sent First Class.

Quantity Discounts
Deduct 10% when ordering 3 or more programs. Dealer discount schedules are available upon request.

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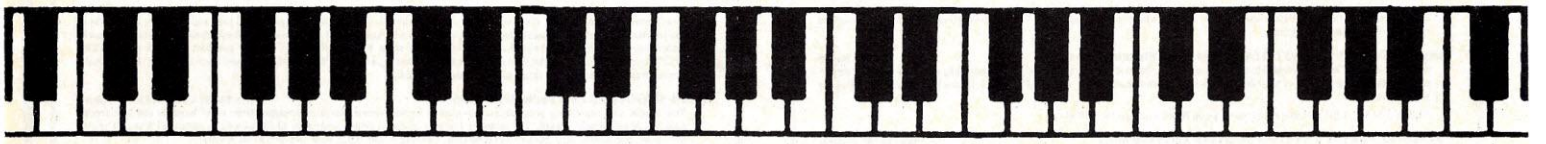

Software Techniques of Digital Music Synthesis

Part 2

Hal Chamberlin

Part 1 of "Software Techniques of Digital Music Synthesis" appeared in the June 1981 issue of Creative Computing. In Part 2, Hal Chamberlin discusses some more complex waveforms and other aspects of digital music synthesis.

More Complex Waveforms

While the previous synthesis algorithms were simple, the variety of waveforms available is not very great. In addition the sawtooth, triangle, and square waveforms present a serious problem that will be discussed later. Since one of the virtues of using computers in music is supposed to be an infinite variety of sounds, we seek a somewhat more general method of waveform generation.

Perhaps the most powerful notion in computing besides iteration is *table lookup*. In applying this to software synthesis, it should be possible to store the sample values representing *one cycle* of a waveform in a table and then simply *scan* through that table repeatedly to produce sample values for the digital-to-analog converter (DAC). Conceptually it is quite simple to store, say, 100 sample values in a table and then write a loop that goes through the table entry-by-entry fetching samples and sending them to the DAC in sequence. Such a loop must also be smart enough to *wrap around* from the end to the beginning of the table each tone cycle.

Using this simple procedure however limits us to one tone frequency if the sample rate is to be constant—which it must. In order to generate other frequencies, one must be able to scan through the table in increments either larger or smaller than a single entry. If the increment is two, for example, then alternate entries in the table are *skipped*. It only takes 50 sample periods to go through the entire table, and the frequency generated is twice as high as before. The increment could also be 3, 4, etc. to get higher frequencies.

At this point the natural question is "Won't the waveform fidelity be sacrificed if half or more of the entries are skipped?" Surprisingly, the answer is no, *provided* the tabulated waveform conforms to a rule that we will discuss later.

In order to produce *any* frequency desired it is necessary that the scanning increment be able to take on *non-integral* values. This then means that *interpolation* between adjacent table entries is called for. Besides familiar *linear* interpolation, one can get simpler and use rounding (fetch the *nearest* table entry) or truncation (fetch the *lower* table entry). One can also get more complex and use quadratic, cubic, and higher order polynomial interpolation or the ultimate which is sinc function (Sin(X)/X) interpolation.

All interpolation (except sinc function) introduces some noise into the synthesized tone because it is only an approximation of what the untabulated sample might be. Linear interpolation is generally sufficient for all sound synthesis applications unless small waveform tables (less than 256 entries) are desired. Linear and higher order interpolation is so time-consuming that it is usually only done in delayed playback systems. Rounding and truncation, which give equivalent *audible* noise levels, will typically introduce more noise into a single tone than use of an 8 bit DAC will, particularly if the tone has a bright timbre. This is less of a problem when numerous tones are playing simultaneously.

Figure 1 shows a tone subroutine using waveform table lookup. The waveform table is assumed to be the W array which is assumed to have 256 entries. This could be changed by converting all the constant 256's in the routine to a variable. Not that most of the subroutine works in the same fashion as the sawtooth wave generator except that the sawtooth samples generated are used to access the waveform table for the actual sample value sent to the DAC.

```
100 FOR I=1 TO D
200 R=R+F
300 IF R>=1 THEN R=R-1
400 TA=INT(R*256)
500 T1=W(TA)
600 TA=TA+1: IF TA=256 THEN TA=0
700 T2=W(TA)
800 T1=T1+(T2-T1)*(256*R-INT(256*R))
900 POKE DA, INT(T1*128+128)
1000 NEXT I
1100 RETURN
```

Figure 1. Waveform Table Lookup Tone Generator.

Hal Chamberlin, Rt. 1 Box 365, Wake Forest, NC.

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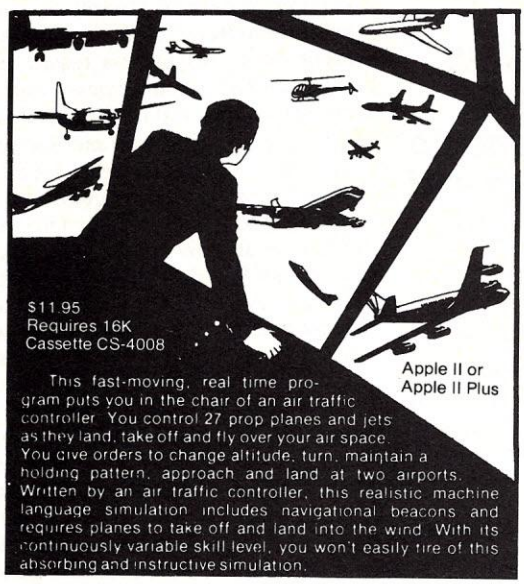

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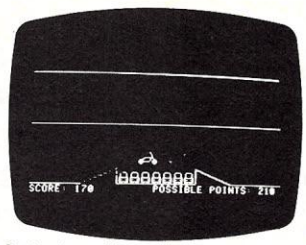

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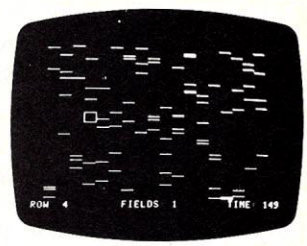

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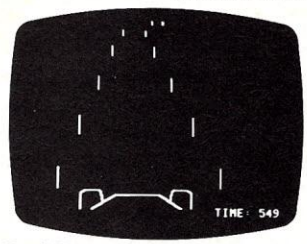

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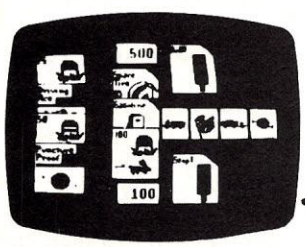
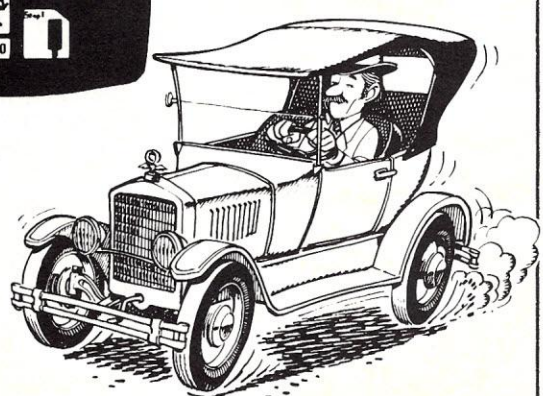


The object of Milestones is to complete a 700-mile auto trip before your opponent, the computer. You must deal with hazards of the roads: stop lights, flat tires, speed limits, accidents and gas shortages. Spectacular high-resolution color graphics.



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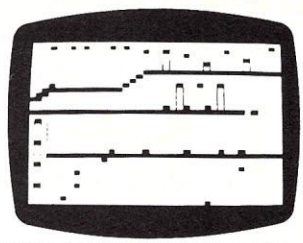

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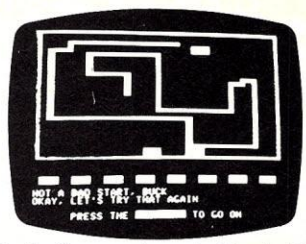
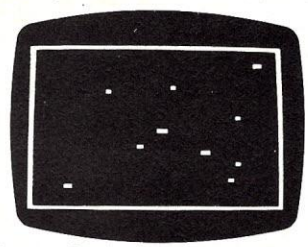


Hustle. The score keeps building but the escape routes dwindle. Can you reach the blocks before they disappear?



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Statements 600-800 perform linear interpolation; if truncation is adequate, they can be omitted. The rigamarole in statement 600 can be avoided by adding an entry to the table that is the same as the first entry. Note that statement 900 assumes that the table holds values between -1 and +1; in a real application, the table entries would probably have been scaled ahead of time to speed things up. Extensions for multiple voices are the same as before. If W became an N by 256 array, then it would even be possible for the different voices to have *different* waveforms.

Filling the Tables

As can be imagined, using waveform tables is a very powerful way to synthesize tones. The next hurdle is filling the waveform tables with the data to produce desirable timbres. The first inclination is to take a "doodle program" that allows the user to "draw" a waveform on the CRT screen or on a graphic digitizer and tabulate the data. This, in fact, can be a very interesting application of drawn shapes. The waveform entry program would have to impose restrictions, however, such as requiring the drawn shape to be a single-value function, which means that the curve does not backtrack in time. Another restriction is that a single cycle of the waveform be drawn which means that the beginning and ending point of the curve are the same.

After using such a system for a time one discovers that there is not much obvious relation between the appearance of a curve to the eye and its appearance to the ear. This is because the ear does not actually analyze the shapes of waveforms; it analyzes their *harmonic makeup*. Thus, entering waveforms by hand is pretty much a hit or miss proposition. In particular, if a drawn shape sounds "almost" like what is desired, there is no systematic method for editing it to sound more like what is desired.

There is not much obvious relation between appearance of a curve to the eye and its appearance to the ear.

Another method of filling the tables, which can be successful, is to digitize the waveform of a musical instrument (assuming that one wishes to synthesize such "ordinary" sounds) with an analog-to-digital converter or *ADC*. An ADC is the exact inverse of a DAC and acts like a high speed digital voltmeter converting audio signals into a string of numbers. The real trick here is to get one cycle of the instrument sound to fit the chosen waveform table size exactly. This typically requires "eyeballing" the recorded sound to find the cycle boundaries (identifying cycles accurately by program is surprisingly difficult) and a rather sophisticated interpolation routine to stretch or compress the cycle to fit the table. Even after all of this is done, resynthesis results may be disappointing for many types of instruments for reasons that will be discussed later.

The most satisfactory method of filling waveform tables has been found to be direct harmonic specification. Actually the ability to specify the harmonic makeup of a tune directly has been desired since electricity first became involved in music in the very early 1900's. The Hammond electronic organ in fact replaces conventional "stops" (in real pipe organs, each stop corresponds to a complete scale of pipes) with "harmonic drawbars" which allow the player to specify the sound in terms of harmonic amplitudes. The drawbars are limited to the fundamental, *2nd* through *6th* and *8th* harmonics however. In 1965, James Beauchamp (a pioneer in the electronic music field) based his doctoral thesis on the design of a "harmonic synthesizer" that could produce any mixture of the first six harmonics at any frequency. Even as late as 1975, a paper on the implementation of an inexpensive 32-harmonic synthesizer was novel enough to be selected for inclusion in the 51st Audio Engineering Society convention. Such feats are now routine on personal computers!

The Basic program in Figure 2 can be used to fill waveform tables from harmonic amplitude and phase specifications. Although for simplicity it is written for a single table of 256 entries, it is easily changed for different sized and multiple tables. The program starts by asking whether the *phases* of the harmonics are important. If the user replies "N," then the phases are determined randomly. Except in special cases, the effect of phase is inaudible, but it always has a great affect on the appearance of the waveform. The program then asks for the harmonic

```
1000 REM WAVEFORM TABLE FILL PROGRAM
1001 REM SELECT RANDOM OR SPECIFIED PHASE
1002 REM ENTER HARMONIC NUMBER FOLLOWED BY RELATIVE AMPLITUDE
1003 REM HARMONIC NUMBER=0 FILLS THE TABLE AND EXITS
1010 DIM W(255): Z=6.283185/256
1020 FOR I=0 TO 255: W(I)=0: NEXT I
2000 PRINT "RANDOM PHASE ANGLES? (Y/N) ";: INPUT A$
2010 PRINT "ENTER HARMONIC NUMBER ";: INPUT N
2020 IF N=0 GOTO 3000
2030 PRINT "ENTER RELATIVE AMPLITUDE ";: INPUT A
2040 P=RND(1)
2050 IF A$="Y" GOTO 2070
2060 PRINT "ENTER PHASE ANGLE ";: INPUT P
2070 P=6.28318*P
2080 FOR I=0 TO 255: W(I)=W(I)+A*SIN(N*I*Z+P): NEXT I
2090 GOTO 2010
3000 M=0
3010 FOR I=0 TO 255
3020 IF ABS(W(I))>M THEN M=ABS(W(I))
3030 NEXT I
3040 M=M+.00001: REM MAKE ALL TABLE ENTRIES < 1.0
3050 A=0
3060 FOR I=0 TO 255
3070 W(I)=W(I)/M
3080 A=A+W(I)*W(I)
3090 NEXT I
3100 PRINT "RMS AMPLITUDE IS "; SQR(A/256)
9999 STOP
```

Figure 2. Waveform Table Fill Program in Basic.

The real-time digital synthesis program described in this article (configured for the PET, Apple II, KIM-1, and AIM-65) along with the necessary digital-to-analog converter may be obtained from: Micro Technology Unlimited, Box 12106, Raleigh, NC 27605 (919)833-1458.

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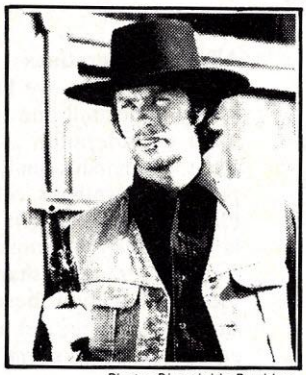

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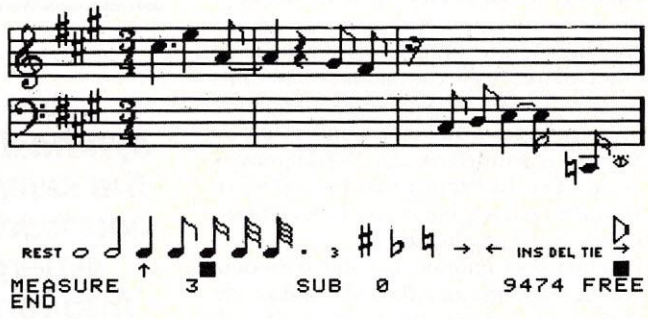
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—Dhahran, Saudi Arabia

I myself have told several people that next to a disk, I consider the [ALF] synthesizer to be the most important peripheral they could purchase for their system. Very excellent job! Keep up the good work.
—Oak Ridge, Tennessee

I recently purchased 2 of your Apple music boards. Out of the peripherals I have for my Apple, I enjoy them the most. It has to be the most enjoyable thing that has ever been invented. I hope you continue to develop products as clever and enjoyable as this one. The Entry program has to be one of the most sophisticated programs I have ever seen. It proves that a hardware manufacturer DOES have the ability to also produce quality software. It is almost worth the price of the boards just for the Entry program.
—Burbank, California

About ease of use:

I have had my Music Card MC1 for a little more than a week now and I have almost completed entering "The Maple Leaf Rag". I found it to be a lot simpler than I thought and so I am very, very pleased. My family isn't because I sit up to all ends of the night playing with the blasted thing!
—Cypress, Texas

ALF has opened up my head and ears and enabled me to do things musically which I would like to be able to do on [conventional] instruments. As much as I love the instruments I try to play, I just don't have the talent and technique to play what is in my head. By golly, the ALF board doesn't know about my limitations, though. I can play hell out of that thing, playing notes and tempos which previously have existed only in my head. Many thanks from a frustrated musician and satisfied ALF "player".
—Demopolis, Alabama

About documentation:

I don't know much about hardware, but I have been a programmer for 15 years and I have never seen a better piece of software documentation than your user manual. It is a joy to study!
—Lancaster, California

About the competition:

Recently, I purchased an [ALF] 9-voice board and a couple of music albums . . . . all I can say is that I wish I had listened and played with it before I purchased the Mtn. Hardware board. It sounds about the same and is vastly superior in software, ease of use, and price. The Entry program is a joy to use and it's easier than Mtn. Hardware's, but then, I guess you guys know that already. (Oh yes, you wouldn't happen to know of anyone that wants to buy a Mtn. Hardware system? $450 or best offer?)
—Kirkland, Washington

I would like to tell you that after having used the system ONLY ONE DAY, that I am absolutely delighted with it. In addition, I purchased the three boards although I ALREADY own Mountain Hardware's music system. Now that I have seen and own your system, I am putting my "old" one up for sale. I think that your software makes it far easier to enter music, and that the software routines allow for far greater flexibility. Again, I extend my compliments to you. As I said, I have owned another music system, and consider myself therefore, qualified to make a judgement between the use of the two. Yours is the clear choice!
—Levittown, New York

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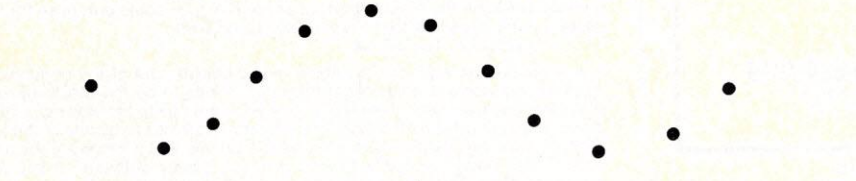
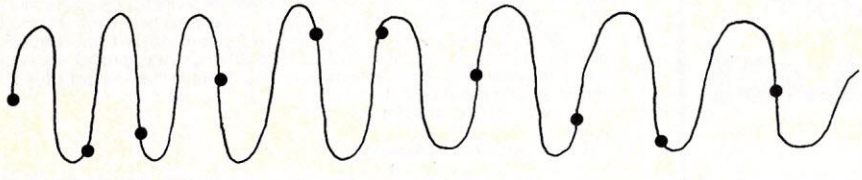
number, its amplitude, and its phase if the first question was answered "Y." Amplitudes are purely relative to each other so the user can assume any units desired. The phase parameter is intended to be entered in full circle units, thus 90 degrees is entered as .25, 180 degrees as .5, etc. The harmonics may be entered in any order and any not entered are assumed to have zero amplitude.

When 0 is entered for the harmonic number, the program then *normalizes* the contents of the waveform table so that all entries will be between -1 and +1 exclusive. Finally it prints out the "root-mean-square" amplitude of the resulting waveform which is a good indication of how loud it will sound. This value is normally right around .5; if it is considerably more or less, amplitude compensation elsewhere in the system might be desirable to insure tonal balance. If random phase was selected, just running the program again with the same harmonic mixture will probably give a somewhat different RMS amplitude. After the waveform table is filled, it would typically be converted to single-byte integers and saved for use by a machine language synthesis program.

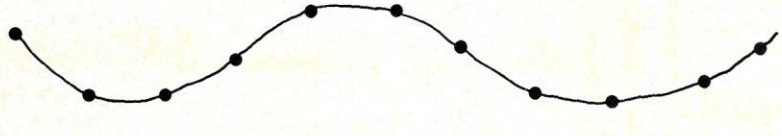
Any frequency synthesized above half the sample rate will be bounced around until it emerges at some frequency below half the sample rate.



A. Computed Sample Set.



B. Intended Waveform.



C. Actual Low-Pass Filter Output.

Figure 3. Illustration of Aliasing.

Alias Considerations

Unfortunately, we have been ignoring a very important and sometimes troublesome consideration that coulld lead to some very harsh-sounding distortion if the preceeding synthesis techniques are applied blindly. The probem is called *aliasing* and is caused by attempting to synthesize frequencies higher than 1/2 of the sample rate. Rather than these high frequencies simply becoming lost as in regular audio equipment, they seem to go into "hyperspace" and re-emerge as entirely different frequencies. The audible effect of this is gross distortion because the transformed or "alias" frequencies usually bear no resemblance to any harmonics of the original tone.

Figure 3 should help in understanding how aliasing works. The points plotted in 3A represent what would come out of the tone generator in Figure 4 if the F parameter had been set to .85 which is clearly above 1/2 the sample rate. The waveform in 3B represents the waveform that the user had in mind with the points superimposed. Note that there are a lot fewer than two points per cycle. Figure 3C shows how the DAC's low pass filter actually interprets this set of points. The waveform that comes out is much lower in frequency than intended. A little study of the figure reveals that this alias frequency is actually .15 of the sample rate which is as much *below* half the sample rate as the intended frequency is above it. While a general rule for predicting alias frequencies can, in fact, be worked out, the important point is that any frequency synthesized *above* half the sample rate will be bounced around until it emerges at some frequency *below* half the sample rate.

What makes aliasing a tough problem to overcome is that the *harmonics* of a tone are just as likely to alias as the fundamental frequency is. The rule that must be followed then is that the highest significant harmonic of a synthesized tone must be less than half of the sample rate. For example, if the system sample rate is 10KHz and one wishes to synthesize high C (about 522Hz), the highest harmonic that may be included is the ninth. If the high harmonics are weak, as they usually are in tones without bright timbres, the rule may be bent a little without objectionable distortion.

When applying this rule, a problem is immediately apparent with the sawtooth, triangle, and rectangle wave generation routines described in Part 1 of this article. These routines are very good and actually generate their respective waveshapes *perfectly*. Unfortunately, perfect specimens

ALF Music Synthesizer

The ALF Apple Music Synthesizer (AMS) is an easy to use peripheral which allows you to program music into an Apple II computer using standard musical notation. The ALF kit includes the synthesizer board (plugs into any peripheral slot), exceptional quality software, and an extensive user manual.

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Three monophonic, individual parts can be programmed with each ALF Music Synthesizer. Two boards are required for stereo. A total of three synthesizers can be used simultaneously for a maximum of nine voices. By controling the envelope (or shape) of each voice, many different instrumental sounds can be simulated.

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The ALF Music Synthesizer has a pitch range of eight octaves—a wider range than a grand piano. The ALF can also play semitones—"blues notes" or the pitches in between the keyboard notes of a piano. (The pitch range is from 27.5 to 55,000 Hertz, well beyond the limits of human hearing.) Tuning accurancy is virtually perfect within two cents of pitch value.

Every parameter of the ENTRY program can be changed again and again during a musical piece. For example, you can make changes in key, time signature, volume, and timbre (envelope). Parts can be edited at any time, also. Notes can be added or deleted, note length can be changed, as well as pitch, volume, etc.

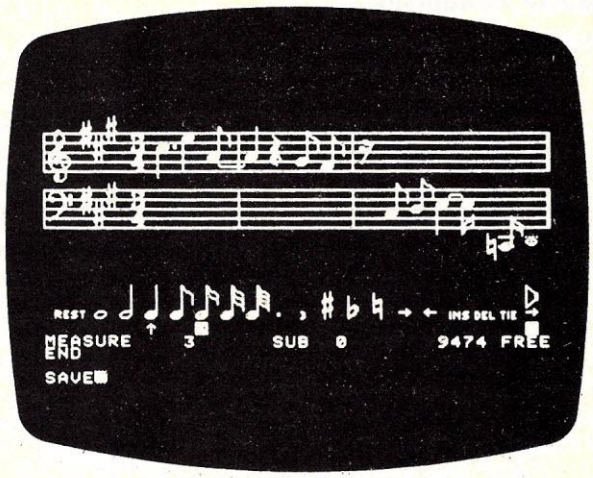
You can save songs on either cassette or disk, and play them back using either ENTRY or PLAY. The playback speed is adjusted with one of the game paddles, and can be varied during the playback, if you wish to change the overall tempo.

Colorful Playback Display

The ALF Music Synthesizer features a 16-color low-res graphic display during song playback. Each musical part is represented on a stylized piano "keyboard"—the intensity of the note determines the color, and the pitch is shown in relation to "middle C".

The ALF Music Synthesizer requires the use of an external audio amplifier. Stereo programming is possible with the use of two or three synthesizer boards.

The ALF software includes the ENTRY and PLAY programs, sample songs, an introduction to "envelope shaping", and demonstrations of advanced uses of the synthesizer.



With the ALF software, entry of music is easy, fast and accurate.

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The AM-II uses the same excellent ENTRY and PLAY programs as the more sophisticated ALF Music Synthesizer (AMS); the same hi-res graphic display from which notes are selected with the Apple game paddles (not typed with cryptic codes). All of the conveniences of the ENTRY program apply—easy editing, playback with low-res display, ability to save songs on cassette or disk, etc.

The AM-II has **stereo output** (3 voices in left, 3 voices in the middle, 3 voices in the right).

How can the AM-II offer so much for only $198.00? The two basic differences between the AM-II and the ALF Apple Music Synthesizer (AMS) are pitch accuracy and dynamic range. The AM-II has an accurate pitch range of about six octaves. Pitch values above the treble staff become increasingly inaccurate. Also, the AM-II has a dynamic range of 28db, with 16 different volume levels, (the AMS has a dynamic range of 78db).

The AM-II is manufactured with the same high quality standards as other products from the ALF Corporation. No sacrifice has been made in reliability; the new AM-II is simply a great bargain.

Professional musicians will still want to use the original Apple Music Synthesizer (AMS) for its extended range and volume controls (the AMS has a range of 8 octaves). But for the Apple owner who is interested in music as a hobby, the AM-II is the best music peripheral value available today.

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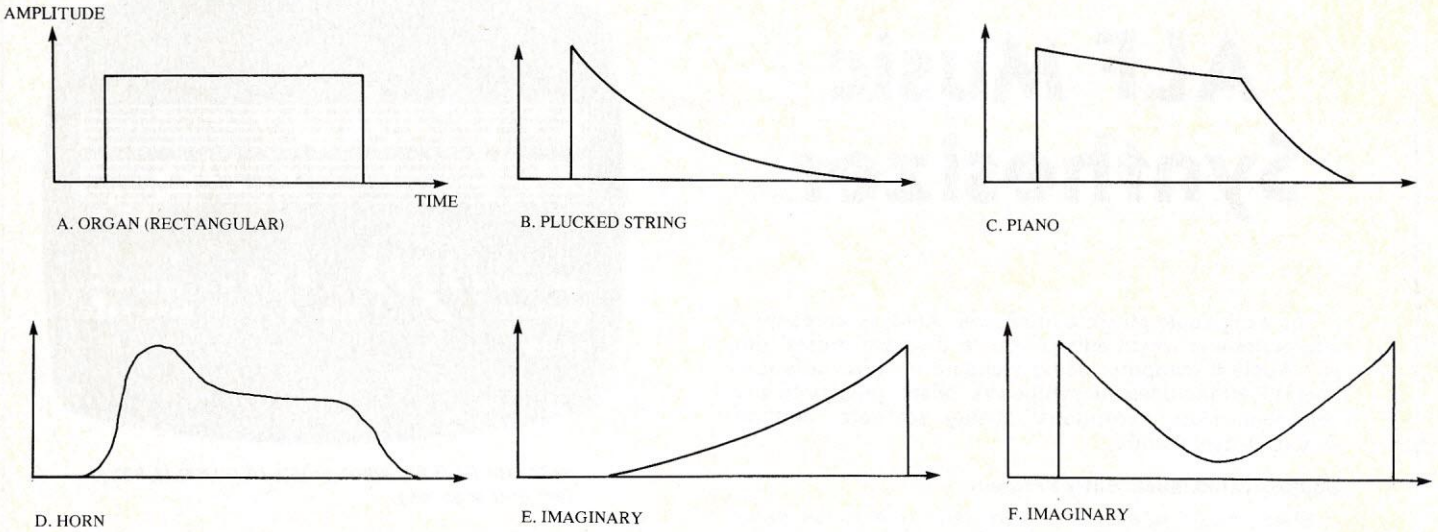

Figure 4. Some Sample Amplitude Envelopes.

of any of these waveforms contain an *infinite number* of harmonics so the rule above will always be broken regardless of the fundamental frequency synthesized! Fortunately, the higher harmonics get progressively weaker, so these waveforms can be useful at low fundamental frequencies. This is the primary reason that these waveforms (at least a perfect synthesis of them) are seldom used in digital music synthesis even though they are used almost exclusively in analog synthesizers.

When using waveform tables filled by the routine in Figure 2, the situation is much simpler. Since the harmonic composition of the waveform is precisely known, it is fairly simple to follow the alias rule. In fact, the possibility of serious aliasing is another argument against drawing waveform tables by hand. If tones are to be generated at widely different frequencies, it may be desirable to split this range into subranges and use a different waveform table for each. Then the waveform for the low notes can have many of the harmonics which are necessary for any degree of "bite" while avoiding aliasing of the higher notes.

Dynamic Parameter Variation

At this point we have suitable methods for producing any number of simultaneous tones at any frequency with any periodic waveform. This would seem to be sufficient for any kind of music, but it actually falls far short. Many desirable features are missing as evidenced by the fact that there are still several higher branches left on the computer tree.

The most important missing feature is an arbitrarily shaped *amplitude envelope* for each tone. What we have now is simply on-off control such as provided by an electronic organ (pipe organs are a little more complex). This is not intended to slight the value of organs as musical instruments but in order to realize the promise of computer music, it is necessary to go further.

An amplitude envelope is nothing more than a graph of how the overall loudness or amplitude of a tone varies with time.

An amplitude envelope is nothing more than a graph of how the overall loudness or amplitude of a tone *varies* with time. Figure 4 shows simplified amplitude envelopes of some common musical instruments. The first is the on-off or *rectangular* envelope just mentioned. Next we have a typical plucked string which starts out loud and then gradually dies out. The last two examples are decidely "unnatural" envelopes the first of which is basically a backward version of the plucked string. Such shapes are popular in "classical" electronic music composition because of their unnatural and dramatic effect.

Conceptually it is quite simple to add amplitude envelope capacity to the synthesis routines discussed earlier. One simply multiplies each waveform sample synthesized by a *synthesized envelope sample*. These envelope shape samples are in turn computed by algorithm or looked up in tables in the same manner as waveform samples. While this works fine, it is time-consuming because the computational work is doubled. One observation that can be made is that the envelope curve varies much more slowly than the waveform curve does. What this means is that we can define an *envelope sample rate* that is much lower than the waveform sample rate. Typically the envelope sample rate is in the range of 100 to 1000Hz or a factor of 10 to 100 times lower than the waveform sample rate.

Implementing this concept is fairly simple. First one determines the ratio of waveform sample rate to envelope sample rate, which for illustration purposes will be 50. Next we will write envelope synthesis subroutines which typically will use the table lookup method although some simple envelope shapes can also be generated by mathematical functions. Finally the envelope and tone generation subroutines will be put together as in Figure 5. The

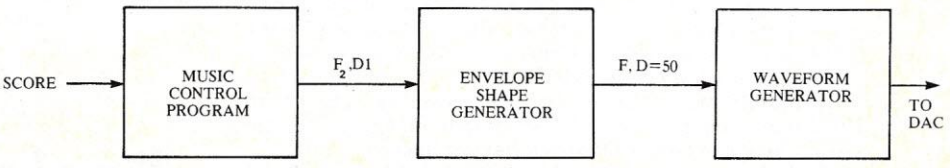

Figure 5. Implementing Amplitude Envelopes.

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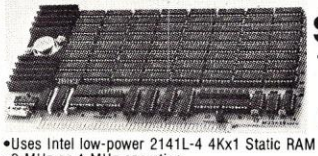

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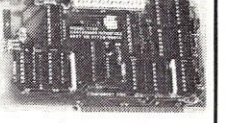

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sequence now to play a note is to tell the envelope routine how long the note is in terms of *envelope periods*. In turn the envelope routine calls the tone routine with a D value of 50 for each of these envelope periods. As can be seen, most of the computation time is still spent in the tone generation routine.

Once the mechanism for implementing amplitude envelopes is implemented, a method must be devised for specifying the envelope shape. Unlike waveshapes, drawing envelope shapes by hand *is* an effective method of specification. One problem that must be resolved is how the shape is to be stretched and shrunk to accommodate notes of different length. A uniform stretch and shrink is easiest, but real instruments typically don't act that way. This may be overcome by defining a "stretch point" or "stretch region" on the shape which allows the attack and decay portions of the curve to be unaffected by stretching. A common technique for specifying envelope curves is to use a four-parameter description called "Attack-Decay-Sustain-Release" or ADSR for short. This allows just four numbers to describe the entire shape. While the ADSR model is quite adequate for most "natural" envelopes, it is not general enough for shapes such as the one in Figure 4F.

Another sound parameter that we may wish to vary dynamically is *frequency*. This is necessary to simulate the glides of trombones or steel guitars or even a wolf-whistle. It is also needed to implement *vibrato* which is a slight wavering of frequency during long notes. The mechanics of implementation are basically the same as for amplitude envelopes, that is, a frequency contour is specified and the 50 sample calls to tone routines will have varying F parameters as well as A parameters. The big problem with including dynamic frequency variation in a system is in specifying the contours, glides, and vibrato. Typically this is done right in the score beside each note that needs frequency variation.

Dynamic Waveform Variation

The last major feature needed for flexible tone generation is the ability to alter *waveform* dynamically. Without this, one cannot simulate the "waaah" of a muted trombone, the "twaaannng" of a sitar, or any of a number of common "synthesizer effects." The main thing that sets dynamic waveform variation apart from dynamic amplitude or frequency variation is that "waveform" or "harmonic structure" is a *multi-dimensional* entity whereas amplitude or frequency is single-dimensional. Not only does this present a specification problem, it also presents a much more difficult implementation problem than amplitude envelopes or frequency contours.

Filtering

Three different methods of dynamic waveform variation have evolved over the years. The oldest simplifies the implementation problem by not messing with the tone generator at all. Instead it defines a *modifier* function that takes a static waveform in and modifies it according to time-varying *modification parameters*. The output then is a dynamically varying waveform! The specification problem is also simplified because there is generally only one varying modification parameter which gives us a one-dimensional control problem again.

This magic modifier box is really nothing more than a *filter* that can be easily tuned. A complete filter specification requires four parameters: *type* (low pass, band pass, etc.), *order* (a measure of circuit complexity), *frequency* (cutoff or center, depending on type), and *Q-factor* (a measure of how sharp the frequency discrimination is). The order is determind by design so it is fixed and the type is selected ahead of time so it, too, is fixed. This leaves frequency and Q-factor that may be dynamically varied. Typically, the Q parameter is also selected ahead of time (that is, statically reprogrammable), and only the cutoff or center frequency is varied.

Filtering is frequently the only method used for dynamic waveform variation in conventional analog synthesizers. In digital synthesis, one must use a *digital filter*. Contrary to popular belief, the programming for digital filters is very simple; what the textbooks make complicated is the explanation of how they work, which is not necessary here. Figure 6, for example, is a "second-order resonant low-pass" digital filter subroutine. The input samples are passed in the input array, I, and are returned in the ouput array, 0. The Q-factor is defined by Q while the cutoff frequency is defined by F and the number of samples to process is defined by D as before. P1, P2, and P3 are internal constants calculated from the supplied values of F and Q. Since these calculations are outside of the main filter loop, they contribute very little to the execution time. D1 and D2 are internal variables like R1 and R2 before and are assumed to be zero when the filter is first used. Below the program listing is the frequency response curve of the filter for several values of Q when F has been set to .05. By changing F, the position of the peak moves back and forth along the frequency axis.

```
100 P1=2*COS(6.28318*F)*EXP(-3.14159*F/Q)
200 P2=EXP(-6.28318*F/Q)
300 P3=1-P1+P2
400 FOR J=1 TO D
500 O(J)=I(J)*P3+P1*D1-P2*D2
600 D2=D1
700 D1=O(J)
800 NEXT J
900 RETURN
```

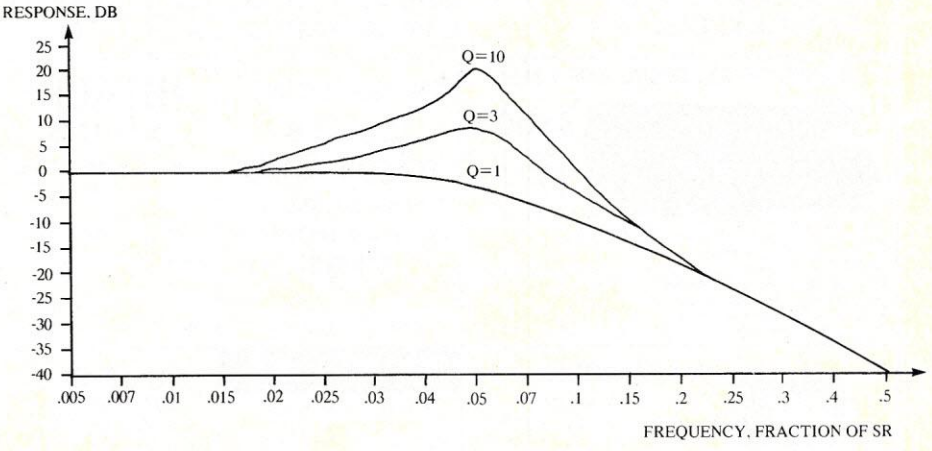

Figure 6. Digital Low-Pass Filter.

FM Synthesis

The second method of dynamic waveform variation was discovered more recently (see Reference 3), and is called frequency modulation or simply *FM synthesis*. Unlike filtering the output of a static waveform generator, FM synthesis involves a new type of tone generator whose waveform can be dynamically varied

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through the alteration of two parameters. Thus it is similar to filtering in that the dimensionality of the waveform control problem is reduced.

Actually the concept of frequency modulation has already been discussed in the previous section under the name of vibrato. The difference here is that the frequency is varied over a very wide range at a very rapid rate. In fact, the range is so wide and the rate so fast that the ear ceases to hear the effect as a warbling pitch and instead interprets the modulation as a timbre change. An FM synthesis tone generator typically uses a sine wave primary tone source which is called the *carrier wave*, and a sine shaped *modulating wave*. Figure 7 shows a kind of "black box" representation of the relationship between the carrier wave generator and the modulating wave generator.

As can be seen, only three parameters are needed to control the FM tone generator. F1 is the undisturbed or *center frequency* frequency of the carrier wave, F2 is the frequency of the modulating wave, and M controls the *degree* of modulation. In normal usage, F2 corresponds to the actual musical pitch of the synthesized tone. F1 and M then determine the timbre in a smooth, yet complex and intertwined, manner. Typically, F1 is made a static multiple of F2 so dynamic waveform control again involves variation of only one parameter, M. Broadly speaking, the F1/F2 ratio determines the basic timbre of the tone (mellow, hollow, thin, etc.) while M determines the brilliance which varies dynamically. IF F1/F2 is *not* an integer, the synthesized tone becomes *inharmonic*, that is, its various overtones are not harmonically related. With this ability, various bell-like and other strange-sounding tones may be produced.

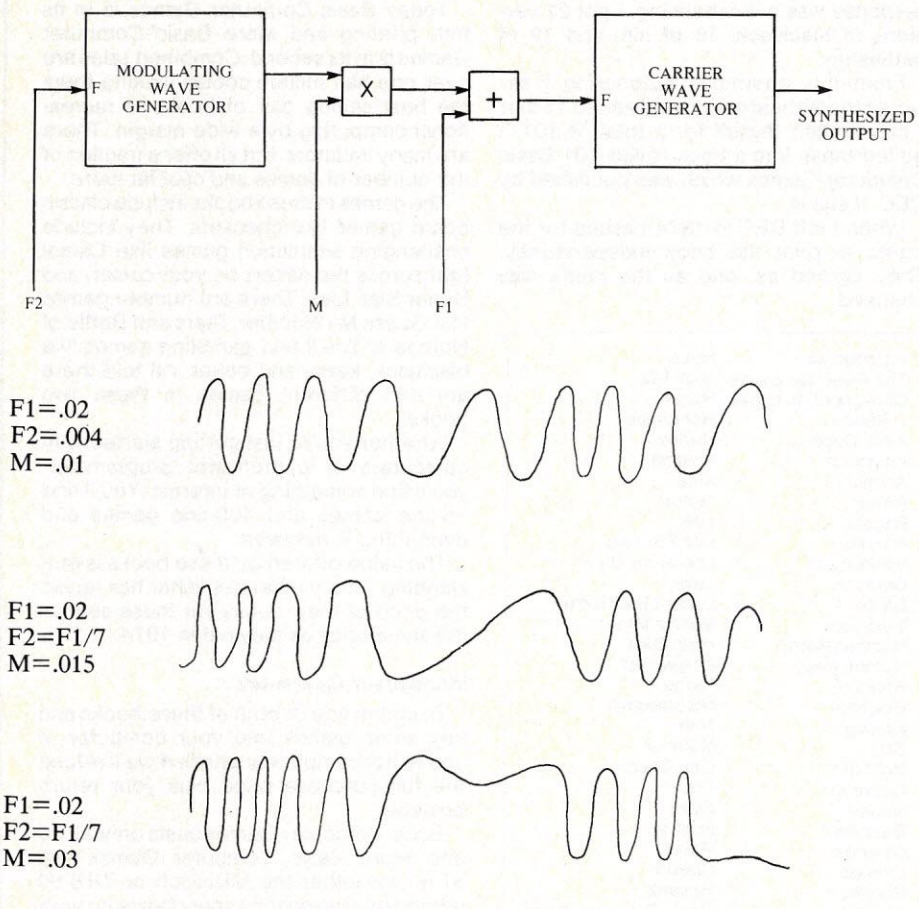

Figure 7. FM Synthesis Tone Generator.

In Figure 8 is a listing of an FM synthesis subroutine. Since the modulation may be very rapid, everything must be done at the waveform sampling rate. Although this example uses the SIN function for simplicity, a practical implementation would surely use sine table lookup instead.

```
100 FOR I=1 TO D
200 R2=R2+F2: IF R2>=1 THEN R2=R2-1
300 F3=F1+M*SIN(6.28318*R2)
400 R1=R1+F3: IF R1>=1 THEN R1=R1-1:
 IF R1<0 THEN R1=R1+1
500 POKE DA,
 INT(127*SIN(6.28318*R1)+128)
600 NEXT I
```

Figure 8. FM Synthesis Tone Generator.

Below the program are some waveforms resulting from different values of F1, F2, and M. In the third case, M has been allowed to become *greater* than F1 which means that at times the carrier wave frequency is *negative*! This is no problem for a digital oscillator which can be designed simply to oscillate in opposite phase for negative frequencies. Negative frequency capability is provided by the second IF statement in line 400.

Waveform Table Interpolation

While filtering and FM synthesis simplify the specification of dynamic waveform variation, they are *not* completely general synthesis techniques. This should be obvious because waveshape or timbre is an N-dimensional quantity and both of these techniques have only one or two control dimensions. For completely general tone synthesis it is necessary to take the bull by the horns and specify how *each harmonic* of the tone varies in amplitude during the note. In effect each harmonic is given an amplitude envelope as illustrated in Figure 9. Such diagrams in fact are often the basis for specifying how the harmonic composition of a tone is to vary.

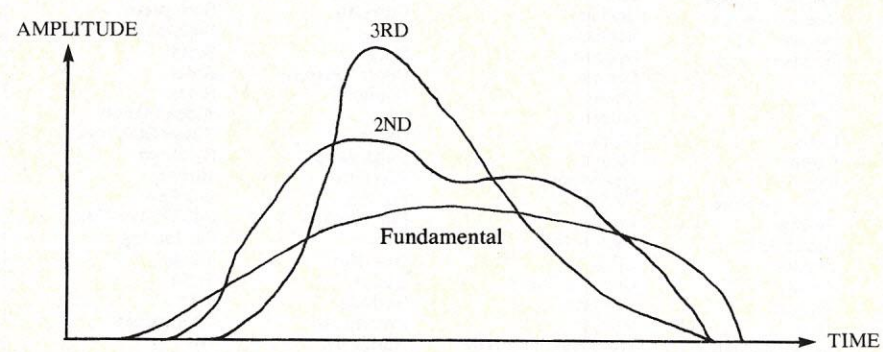

Figure 9. Visualization of Individual Harmonic Envelopes.

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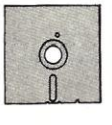

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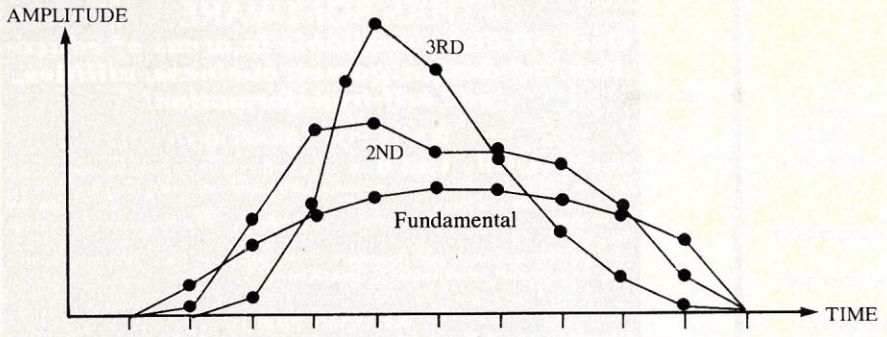

Figure 10. Line Segment Approximation of Figure 9.

There are two ways to generate a tone according to a specified set of harmonic envelopes. The "brute force" method is to consider the tone as a collection of harmonics and set up a bunch of sine wave generators each with its own amplitude envelope. While reasonably practical in a *hardware* digital synthesizer, the fact that there may be dozens of tone generators tied up in producing just one final tone means that the method can be time-consuming.

Another method is to take the set of harmonic curves, break the time axis up into short intervals, and then approximate the curves with straight-line segments in each interval. Figure 10 illustrates how this might be done using the previous curve set as a basis. The next step is to construct a waveform table which corresponds to the harmonic mixture at the *beginning* of each interval. Thus, if there are 10 intervals, there would be 11 waveform tables. As time passes during synthesis, one would actually *interpolate* between the waveform tables at each end of the current interval as illustrated. This is an extremely effective and general synthesis technique and is well suited for software synthesis systems. In particular the computational effort is less than double that of static waveform generation by table lookup.

A synthesis subroutine using waveform table interpolation is shown in Figure 11.

```
100 M=0: M1=1/D
200 FOR I=1 TO D
300 R=R+F: IF R>=1 THEN R=R-1
400 TA=INT(R*256)
500 TC=W1(TA)*(1-M)+W2(TA)*M
600 POKE DA, INT(TC*128+128)
700 M=M+M1
800 NEXT I
900 RETURN
```

Figure 11. Waveform Table Interpolation Subroutine.

It interpolates between waveform table W1 and waveform table W2 such that W1 fades out and W2 fades in. The number of samples processed is D as before and the fadein-fadeout process is adjusted so that it is just complete after the D samples. Thus in use, D is set to the number of samples in an interval. Note that the table lookup itself is done with truncation for simplicity; for the highest audio quality one would want to interpolate within the tables as well as between them.

There is no reason that these synthesis techniques should not be combined since each has distinct advantages and disadvantages. In fact, a truly complete software synthesis system of the delayed playback variety should have provisions for all three.

Percussion Synthesis

By using the techniques already discussed, one can synthesize literally any kind of definitely pitched tone. However, percussive sounds are also quite important but usually neglected in music systems for personal computers. To appreciate how important they are, just try to imagine a marching band or even a rock band without drums!

Percussive sounds generally consist of two parts, a *pitched* part and an *unpitched* or random part. The "tock" sound of a wood block consists almost entirely of a pitched part while cymbal crash is entirely unpitched. The sound of a snare drum is a roughly equal mixture of both parts. The pitched part of a percussive sound is easily taken care of with techniques already covered. The wood block for example can be simulated quite closely simply by applying a very short amplitude envelope to a sine wave tone. One must, of course, adjust the sine wave frequency and the envelope shape and duration properly to get the desired effect.

The unpitched part of a percussive sound involves the use of *white noise*. Fortunately, samples of white noise are so easy to compute that there won't even be an example progam for it. One simply uses the RND functions of Basic whenever a sample of white noise is desired! The cymbal crash can be simulated by applying a fast rising slowly decaying amplitude envelope to a string of random numbers. Synthesis of the snare drum involves a combination of the two techniques.

Many percussive sounds require the pure white noise to be modified or "colored" so that some frequencies are more prominent than others. This is accomplished by passing the random numbers through a digital filter like the one in Figure 6. A bass drum for example is mostly enveloped, low-pass filtered white noise with a very low cutoff frequency. Maracas are best simulated with a band-pass filter set for a center frequency of about 1.5KHz and a Q of about 1.

Reverberation

Even when applying the most sophisticated synthesis techniques known, computer music tends to sound lifeless and flat. The effect is a lot like an orchestra playing on a hilltop or in a small room filled with tons of cotton. The missing ingredient is *reverberation*. One simply cannot appreciate the value of reverberation in synthesized music without a before and after demonstration.

Good concert-hall reverberation is considerably more complex than mere echo simulation. Actually concert-hall reverberation is the result of an infinite number of echoes each with a different delay time. While the programming for concert-hall

```
100 O=I+E1*DL(P1)
200 DL(P1)=DL(P1)*E2+I
300 P1=P1+1
400 IF P1>4000 THEN P1=0
500 RETURN
```

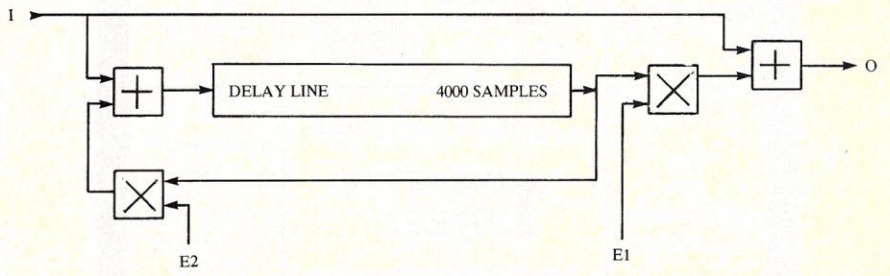

Figure 12. Simple Echo Simulator.

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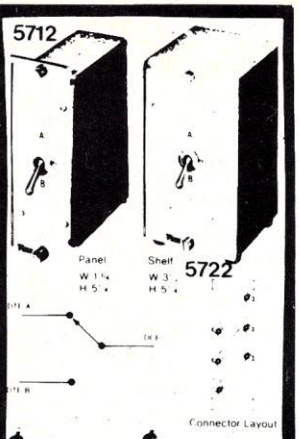

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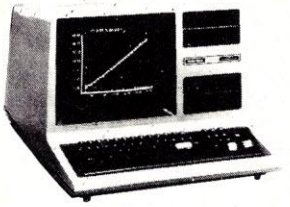

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reverberation is too involved to be illustrated here, Figure 12 shows both a black box representation and an example subroutine for echo simulation. The long delay line in the echo simulator is a large array in the program called DL. The number of elements in the array determines the time between echoes. Thus if an echo delay of 0.2 second is desired (roughly equivalent to a canyon 100 feet wide) and the audio sample rate is 20KHz, the DL array would need 4000 elements! In order to avoid shifting all 4000 elements of the array for each sample processed, a *pointer* called P1 is maintained instead. As written, the subroutine accepts a single raw sample input called I and returns a single raw sample output called 0. The E1 parameter determines how loud the echoes are compared with the direct sound while E2 determines how quickly the echoes die out and must be less than one.

A Practical Real-Time Synthesis System

Before concluding it would be a good idea to look at a couple of practical applications of these concepts and techniques on current personal computers. Probably the most sophisticated real-time implementation is based on a program written by Frank Covitz with help from Cliff Ashcraft and me, and first demonstrated in April of 1979 at the Trenton, NJ Computer Festival. The program to be described is written in machine language for 6502-based systems such as the PET, Apple, and KIM/SYM/AIM single-board computers. Because of its indexed and indirect addressing modes and overall high speed, the 6502 seems to be more effective in implementing the various synthesis algorithms, particularly those involving table lookup. Nevertheless, systems based on other microprocessors can certainly do the same although a higher than standard clock frequency will be necessary to match the performance of the system to be described.

In a real-time system there is always a tradeoff between the number of simultanous voices and the sample rate. For most music a minimum of three voices is required although four is a substantial improvement. Six to eight is sufficient for virtually anything written for the piano or organ. In the 6502 implementation, four voices were chosen to allow a sample rate of 8.47KHz. With higher speed 6502-based systems we can get more of either or both. The Atari systems with their 1.66MHz clock for example could theoretically do six voices at a slightly higher rate. A 2MHz 6502 could do six voices at a 12KHz rate while a 3MHz system, which is actually available from Ohio Scientific, could do eight voices at a 12KHz rate!

Because of its generality and ability to control aliasing problems, the table lookup method is used to synthesize the tones. The table length is 256 entries and each entry is a single byte. The table pointers and increments however are processed with 16-bit integer arithmetic which gives a frequency resolution of 0.12Hz. This is equivalent to a maximum error of 0.023% or about 1/2 cent at middle C. Unfortunately, even linear interpolation between table entries is way too slow for real-time on the 6502 because at least one *multiplication* is required. As a result, the table pointers are simply truncated during the lookup. This tradeoff does lead to some excess noise beyond what the 8-bit table entries produce themselves, but it is not objectionable.

Concert-hall reverberation is the result of an infinite number of echoes each with a different delay time.

Dynamic amplitude variation and dynamic waveform variation are both implemented by stepping through a sequence of waveform tables as discussed in an earlier section. Unfortunately, interpolation between two tables is just as time-consuming (because of multiplication) as interpolation within a table so it is not performed. Instead, the core synthesis routine simply goes from one table to the next, giving a stair-step approximation to the smooth harmonic envelopes of Figure 9 instead of a straight-line approximation. Unfortunately, in order to make the contrast from table to table small enough to avoid an objectionable stepping effect, a fairly large number of tables is needed. Typically, from 16 to 32 tables are sufficient for a "well- behaved" instrument. The resulting 4K to 8K of memory needed to hold an "instrument definition" limits the number of different instruments "on line" in most systems to about three or four. Even though the actual synthesis uses a step approximation to the curves, the user still specifies a straight-line approximation to reduce the amount of data that must be specified.

At this time advanced features such as dynamic frequency variation, percussion instruments, and reverberation are not specifically provided for. The strong point of the system is probably the excellent job that can be done in simulating familiar instruments, particularly if one has analysis data for the instrument in question. Reference 2 is one source for such data. There is plenty of flexibility however for creating some really far out sounding instruments as evidenced by some of the music already coded for the system. An audio cassette demonstration tape of the system is available from Micro Technology Unlimited, Box 12106, Raleigh, NC 27605.

One drawback of the system as it now stands is the lack of a "music compiler" or editor program. The synthesis routines function as an "intelligent synthesizer" that reads coded music and instrument data from memory in binary not unlike a microprocessor chip reads machine language instructions. Actually what is needed now are *two* programs, one for entering and editing *music* and one for experimenting with instrument definitions.

Delayed-Playback Systems

While one can do amazing things with real-time software digital synthesis on a personal computer, the compromises, short cuts, and relatively low rates necessary leave something to be desired in the area of fidelity. With delayed-playback, any or all of the compromises may be eliminated, the sample rate and DAC accuracy may be increased to true hi-fi levels, and any desired musical feature that can be defined, can be implemented on a personal computer. Playing a musical selection is actually a three-step process. In the first step a machine-readable score is entered or edited from a previous run. Typically the score file on disk is just a standard ASCII text file so a standard text editing program is sufficient. In advanced systems other methods of score entry are possible such as graphic input with a light pen, joystick or digitizer or even direct input from a music keyboard. In any case, the result of the first step is an integrated score and instrument definition file on disk.

In the second step, a music interpreter program, which also contains all of the synthesis routines, reads the score file, carries out the indicated synthesis operations, and writes a *sound file* on disk. While the majority of the human work is spent creating and editing the score file, the vast majority of machine work is spent computing the sound file. A minute of final sound may take anywhere from five minutes to whatever the user can tolerate of CPU time to compute depending on the sample rate, number of simultaneous voices playing, and the sophistication of the synthesis techniques. Most of this time is spent in arithmetic subroutines so a microprocessor with automatic multiply (such as the 6809, 9900, and all of the 16-bit units) or the availability of an arithmetic processing chip (such as the AMD 9511) is a distinct advantage.

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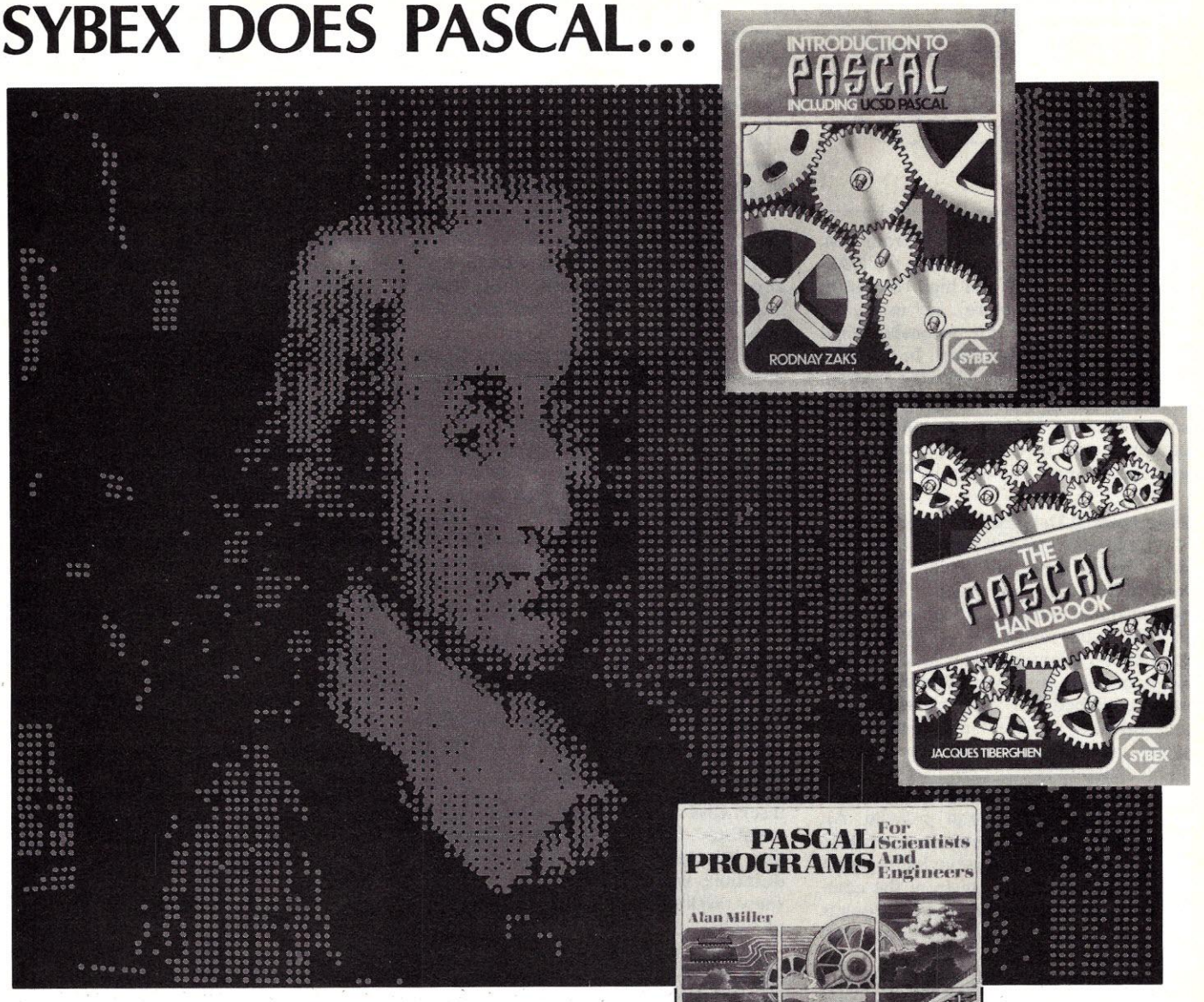

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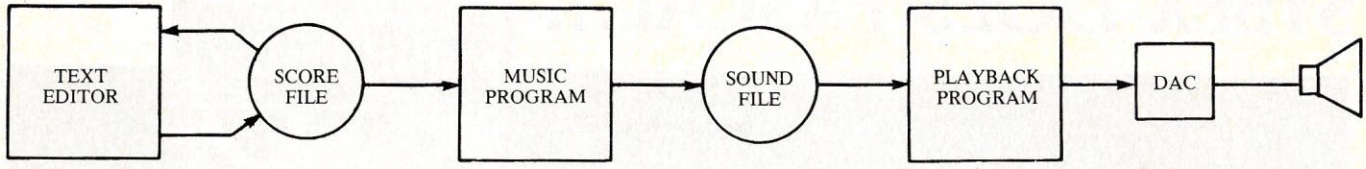

Figure 13. Delayed Playback Synthesis System.

program reads the sound file from disk and sends the sound samples to the DAC at a uniform rate. When high resolution DACs (10 bits or more) are used, the uniformity of sample rate becomes critical to minimize jitter distortion. In order to achieve such uniformity while the program is also handling data readback from the sound file, the DAC must generally be equipped with its own sample clock and at least one level of data buffering.

Experimental Delayed-Playback System

An experimental delayed-playback software digital synthesis system has been implemented by the author and was demonstrated at the PC'80 computer show in Phildelphia in the Fall of 1980. It ran on a KIM-1 microcomputer (a 6502-based single board computer made by Commodore) equipped with 24K of usable RAM and a dual 8" double-density floppy disk system made by MTU. An experimental 12-bit digital-to-analog converter was used to provide a much lower background noise level than 8-bit units can provide. An important feature of the experimental DAC is a 256 sample first-in-first-out buffer which allows the sample stream from the computer to be interrupted for milliseconds at a time without affecting the smooth flow of data to the DAC itself.

When floppy disks are used to hold the sound file, the disk format is an important determinant of the maximum playback data rate. While the normal disk operating system software (which is used to prepare the score file) uses the standard IBM disk format of 26 sectors of 256 bytes each, the total diskette capacity is only about 512K bytes. A different format consisting of 16 sectors of 512 bytes is used for the sound file which give 630K bytes per disk, a 23% increase in potential data rate as well as capacity. In order to read through the sound file at high speed, it is mandatory to be able to read all of the sectors on a track in one revolution of the disk. In addition, one must be able to step to the next track waiting for a whole disk revolution before reading again. Staggering of the sector numbers by three on adjacent tracks accomplishes this. The resulting *sustained average* data rate from the disk can approach 40K bytes per second. The actual playback program currently uses a 20 KHz sample rate with 12-bit samples for a total data rate of 30K bytes per second. At this rate, an 8" diskette holds about 21 seconds of sound. Going to double-sided diskette would double the capacity to 42 seconds. Mini-disks have about half the capacity but more importantly, only half the maximum data rate.

The synthesis and computation phase of a performance is relatively straightforward on the experimental system. The score file is read from drive 0 using the normal disk operating system and the sound file records are written onto drive 1 using a set of specialized disk driver routines to handle the dense sound file format. When a sound disk is filled up, the synthesis program waits for a new disk to be inserted into drive 1.

When the playback program is called in, the operator is expected to put the first sound disk in drive 0 and the second one in drive 1. When playback starts, the first 21 seconds of sound are read from drive 0 and then an immediate, inaudible switchover to drive 1 is performed. During the next 21 seconds, the operator must remove sound disk 1 from drive 0 and insert disk 3 to be read when disk 2 is exhausted. One can switch back-and-forth like this indefinitely for music of any duration; the performance at the PC'80 show required 23 disks for eight minutes of sound.

The problem in using this system is not the disk jockeying required during playback, but the changing of disks during computation. With the music selected for performance, a new disk was required about every 15 to 30 minutes which means that one can't sleep very long while the program is running. Clearly a 10M byte hard disk would be advantageous here.

At this point the experimental delayed-playback synthesis program does about the same things as the real-time synthesis program mentioned earlier. The major differences are an essentially unlimited number of voices, interpolation between waveform table entries, and interpolation between adjacent waveform tables in the sequence rather than sudden switching. It won't be considered complete until FM synthesis, digital filter synthesis, percussion instruments, dynamic pitch variation, and reverberation capabilities are added.

The Future

While these developments may seem exciting now, the future is likely to see many more exciting things happen in the field of music synthesis on personal computers. The sophisticated programmable synthesizer boards will undoubtedly get more sophisticated and gradually come down in price. Today's square-wave synthesizer chips will probably be supplemented by programmable waveform synthesizer chips which use direct memory access to scan waveform tables in memory automatically.

The most exciting prospects are in the software synthesis area, however. The processors used in personal systems will gradually get faster at the machine language level which will increase the capability and fidelity of real-time software synthesis. Even a simple step up to 16 bits, which is inevitable, will nearly double the speed of the basic synthesis routines, giving both more voices and higher frequency range. Because of the very low cost of including a DAC in the circuitry of a computer, it is expected that most new systems will have them built-in.

On the delayed-playback front, experimental systems such as the one just described will reach full development and make it possible to produce significant music of real commercial value with personal computers. Even the very general and powerful MUSIC-11 system (truly the ultimate in sound synthesis flexibility) has already been implemented on the LSI-11 computer (used in the Heath H-11 system) and it is only a matter of time before it is available for the more common computers. The decreasing cost and increasing capacity of small hard disks will also make using a delayed-playback type of system much more convenient as well as increasing the fidelity even further. □

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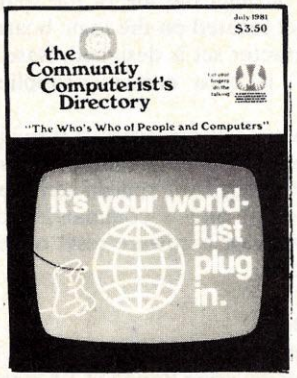
it's a directory



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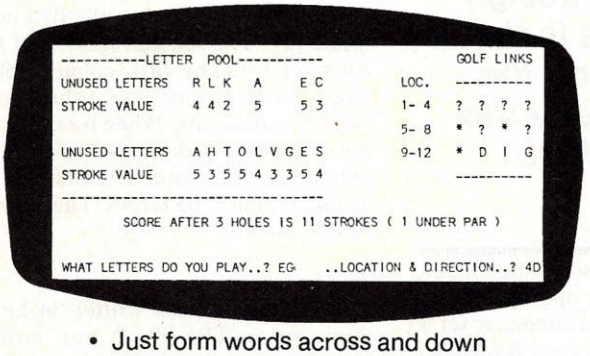
----------LETTER POOL----------
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STROKE VALUE 4 4 2 5 5 3
UNUSED LETTERS A H T O L V G E S
STROKE VALUE 5 3 5 5 4 3 3 5 4
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WHAT LETTERS DO YOU PLAY..? EG
GOLF LINKS
LOC.
1- 4 ? ? ? ?
5- 8 * ? * ?
9-12 * D I G
..LOCATION & DIRECTION..? 4D

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CIRCLE 159 ON READER SERVICE CARD

First a Line Printer —Now a Line Writer

Bruce A. Newell

All printers can print. Now, some can write! Shortly after purchasing my Base 2 Model 800 printer, I began experimenting with its many features. One feature in particular that I found extremely fascinating was the ability to design alternate character sets. (I use the terms "character set" and "character font" interchangeably.) The user-defined character sets can be downloaded from the computer to the printer and can be called into use as desired.

I thought a written character font would be unique and its design might prove to be an interesting learning experience. Once I started the task, I found that the 5 x 7 dot matrix was somewhat restrictive. (Base 2 has announced an optional 9 x 7 character font, but it is not in production at this writing.) The results of my efforts can be seen in Figure 1.

One nice thing about the ability to design character fonts is that it also gives you the ability to modify the standard font. For instance, you can have your zeroes slashed if you so desire, or you specify " ↑ " instead of the common "]." You can also have all other arrows or any other custom symbol you desire intermixed with standard font characters. All this can be done by modifying only those characters that are to be different.

Bruce A. Newell, 9712 Kent Drive, Midwest City, OK 73110.

The Base 2 printer is capable of storing internally ten character fonts at once. These character fonts are of three different types and are provided for in three different areas of memory in the microprocessor control section of the printer.

One nice thing about the ability to design character fonts is that it also gives you the ability to modify the standard font.

The standard character set is the default condition and is enabled upon power up or reset. The user-defined character set is contained within the on-board RAM and is implemented by issuing two specific function codes to the printer. These codes will be discussed in the Program portion of this article. An additional eight auxiliary character sets can be made available within the printer through the use of the spare 24-pin socket located on the logic board. After a character set is designed, Base 2 will "burn" it onto customer-supplied EPROMs.

All character sets are enabled through software control. Once a character font has been activated, it will remain activated until a different one is commanded or until a software or hardware reset of the printer is done.

How It Is Done

The actual design of character sets is accomplished by using Basic DATA statements. It takes a total of 480 bytes of data to design a complete set of 96 characters, each of which consists of five bytes. The character is seven dots high and has a maximum width of five dots. Essentially, each byte represents one column width of the character.

To determine the correct value for the data statement follow these instructions carefully. If the letter "F" is desired, the first column would contain seven dots. The second column would contain only two, one in the top row and the other in the fourth row. The third and fourth columns would be the same as the second. The fifth column would contain only one dot in the top row. (See Figure 2.)

Each of the rows corresponds to a power of two. The top row is 2^0 or 1, the second row is 2^1 or 2, the third is 2^2 or 4, etc. In the first column, add together the number associated with each row containing a dot. Do the same for each column. In our example, the first column totals 127. The second, third, and fourth each total 9. The fifth column totals 1. These numbers are the values for the DATA statements. When a column does not contain any dots, the value for that column is zero. Note: The first five bytes should normally be zeroes. This will represent a space.

The Program

The program was written in Level II Basic on a TRS-80. It can easily be

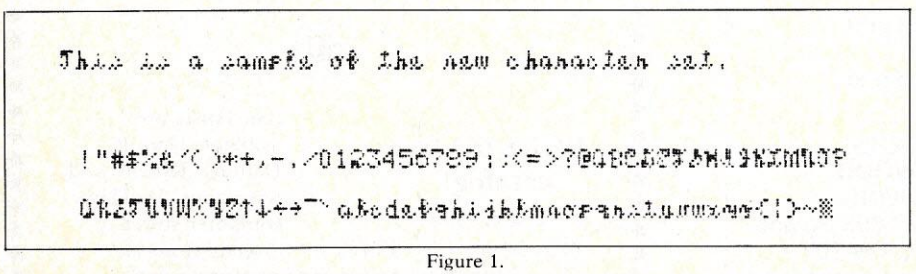
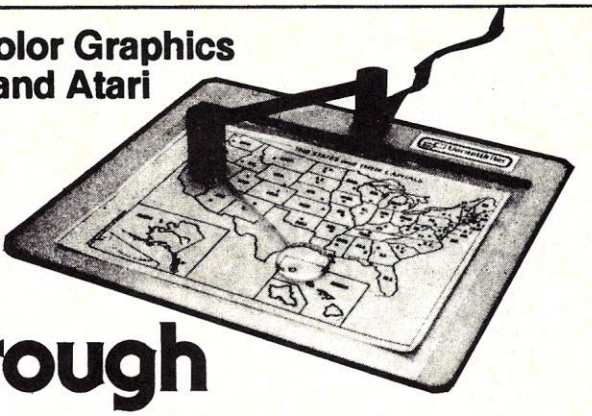


Figure 1.

Byte Number	1	2	3	4	5
1	*	*	*	*	*
2	*				
4	*				
8	*	*	*	*	
16	*				
32	*				
64	*				
Total	127	9	9	9	1

Figure 2.

High-Resolution Color Graphics for the Apple and Atari



Graphics Breakthrough

How many programs have you written that would benefit from animated high-resolution graphics? Probably several. It is this kind of dramatic graphics that distinguish outstanding programs from ordinary ones. But if you've ever agonized for hours or days just to get one image perfected, you're probably not anxious to do it again. Now there's a better way.

New Graphics Entry System

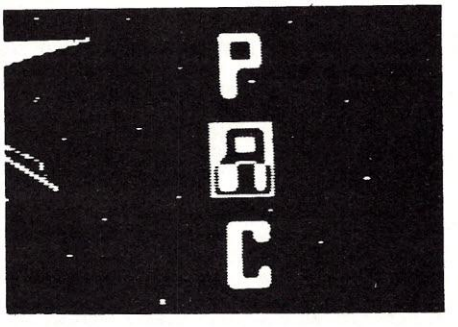
Today there is a new graphics system available that is not only amazingly user-oriented but surprisingly economical. Called VersaWriter, it starts with an ingeniously simple entry board consisting of a 14" X 12" high impact plastic bed with a tough clear plastic overlay sheet. The original drawing or diagram is fastened with masking tape to the plastic bed and then covered with the clear sheet. Instead of using a light pen or complicated electronic X-Y head, the VersaWriter uses a double jointed arm attached to the top of the entry board at one end and a magnifying lens with crosshairs at the other end. The VersaWriter resembles a draftsman's pantograph on a smaller scale.

At each joint in the arm of the VersaWriter is a potentiometer. A cable from these pontentiometers connects to the paddle input of the computer. No special interface electronics or board is needed. Since the arm of the VersaWriter bends only in one direction, each point on the plotting head corresponds to a unique set of resistances on the potentiometers. All that's needed now is software to translate these resistances into usable screen coordinates.

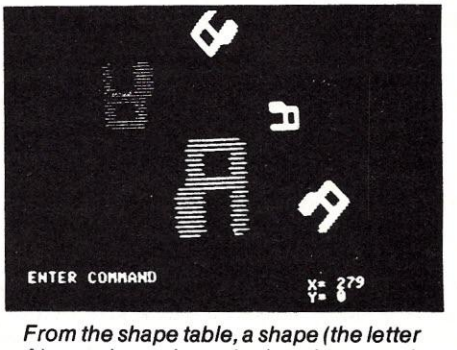
Exceptionally powerful software

It is in the software where VersaWriter really stands out. VersaWriter comes with two full disks of user-oriented software. First it has sets of "low level" commands for entering, creating and copying drawings and diagrams. Secondly, it has extensive sets of application routines for moving, enlarging, rotating, coloring or animating drawings that the user has created.

Of course the basic commands let you enter a drawing freehand or by tracing it. Want a wider "brush stroke"? Six widths are available. Drawings can be independently scaled in both the vertical and horizontal directions. An enclosed shape may be filled in with any of 212 colors. No, that is not a misprint—by the same technique that a printing press can create hundreds of colors from three primary ones, so can VersaWriter.



Here a shape (the letter A) is being scanned. After putting it in a shape table it may be used in other programs.



From the shape table, a shape (the letter A) may be enlarged, shrunk, rotated, colored or moved about the screen.

Create Animation for Other Programs

The shapes you create with VersaWriter can be used and manipulated with ease in other programs. Up to 255 shapes can be entered into a shape table. These shapes may then be placed on the screen in any position or may be overlaid on a full or partial screen image. Animation is produced easily by moving about a portion of the image created by VersaWriter. For example, by alternating between two images of an airplane propeller it will appear to be spinning.

Other VersaWriter software includes text-writer with which text can be added to graphics. Upper and lower case, choice of color, text size, direction and starting point all may be specified.

The Area/Distance program lets you calculate distances (or perimeters) by entering a scale and tracing a shape or map route with the drawing arm. Areas of figures, open and irregular, can be similarly calculated.

The software also includes sets of electronic and computer logic shapes. In addition, an entire disk of dramatic demonstration graphics is included. These twelve full-screen graphics run the gamut from a fully labeled cross section of a human skull to colored maps to animated cartoons to an electronics schematic.

Free Software Updates

You may have read a review of VersaWriter that indicated that the color fill routine was slow. It was. But not anymore. Several new routines and improvements were added to the VersaWriter software since its introduction. All customers of Peripherals Plus received these changes free.

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converted for use with other computers by replacing the "LPRINT" commands with the appropriate commands for writing to a printer port. Also, the "LPRINT CHR$(27);LPRINT CHR$(X);" equates with the "control" function, followed by the appropriate ASCII character.

Once the program is run, you can type "NEW." The character set will remain loaded in the printer.

Line 10 defines variables "X" thru "Z" as integers to speed up the loading process.

Lines 20 through 40 reset the printer to initialization parameters, set line density of 80 characters per line, and enable the loading of the user defined character font.

Lines 60 through 90 set up 480 bytes to be loaded into printer. It accomodates 96 characters composed of five bytes each. Adding the 128 ensures that a TRS-80 control code is not being commanded. Note: An entire character set of 96 characters must be formatted even if only one character is to be modified from the standard character set.

Line 110 enables user the defined-character font.

Line 160 enables the standard ASCII character font in the event the character set just loaded is graphics or some other special font in which case the message in line 170 may be garbled.

Lines 180 through 200 set up a table to display the loaded character set.

Line 210 enables user defined character font for use in the table.

Lines 220 through 260 set up the remainder of the table.

Lines 310 through 330 enable the user-defined character font, sets line density to 80 characters, and enable the elongated character mode.

Lines 360, 380, 400, 420, 440 and 460 sets line densities to 64, 72, 80, 96, 120, and 132 characters per line respectively.

Line 490 prints the user-defined character font.

Lines 560 through 580 enable the standard ASCII character font, return line density to 80 characters, and enable the elongated character mode.

The first half of line 610 enables the user-defined character font while the last half enables the standard ASCII character font.

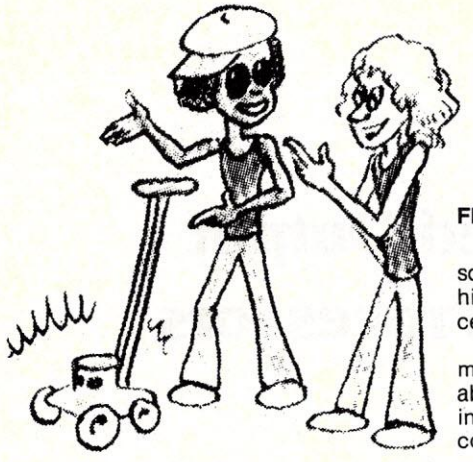
With the exception of line 1190, each of the data statements provides 25 bytes for defining five of the user-defined characters.

Now that you know how to design character sets, you can give your Base 2 printer a personality of its own, making it more than just a "line printer."

If you decide to design an interesting character set, I would be very interested in a listing of the program and a sample printout. □

```
1 'AN ORIGINAL TYPE FONT FOR THE BASE 2 PRINTER
2 'BY    BRUCE A. NEWELL
         9712 KENT DRIVE
         MIDWEST CITY, OK  73110
         (405) 732-0866
3 'FINAL DESIGN COMPLETED 28 MAY 1980
10 DEFINT X-Z
20 LPRINT CHR$(27);CHR$(74);
30 LPRINT CHR$(27);CHR$(49);
40 LPRINT CHR$(27);CHR$(75);
50 CLS:PRINT:PRINT"LOADING"
60 FOR Y=1 TO 480
70 READ Z:Z=Z+128
80 LPRINT CHR$(Z);
90 NEXT Y
100 LPRINT
110 LPRINT CHR$(27);CHR$(76);
120 CLS:PRINT:PRINT"LOADING COMPLETE"
130 INPUT "DO YOU WANT A COMPLETE LISTING OF THIS CHARACTER FONT (Y/N)";A$
140 IF LEFT$(A$,1)<>"Y" THEN 280
150 LPRINT:LPRINT
160 LPRINT CHR$(27);CHR$(77);
170 LPRINT TAB(15);"LOADED ALTERNATIVE ASCII CHARACTER FONT":LPRINT
180 FOR C=1 TO 16
190 FOR B=1 TO 6
200 D=31+(C-1)*6+B
210 LPRINT CHR$(27);CHR$(76);
220 LPRINT "ASC ";:LPRINT USING"###";D;
230 LPRINT ": ";:LPRINT CHR$(D);"  ";
240 NEXT B
250 LPRINT " "
260 NEXT C
270 LPRINT:LPRINT
280 INPUT "DO YOU WANT A COMPLETE PRINT SPECIMEN (Y/N)";A$
290 LPRINT:LPRINT
300 IF LEFT$(A$,1)<>"Y" THEN 600
310 LPRINT CHR$(27);CHR$(76);
320 LPRINT CHR$(27);CHR$(49);
330 LPRINT CHR$(27);CHR$(64);
340 LPRINT "          Base 2 Printer Test"
350 LPRINT:LPRINT
360 LPRINT CHR$(27);CHR$(100);
370 LPRINT "64 Char. per line.";:GOSUB 490
380 LPRINT CHR$(27);CHR$(48);
390 LPRINT "72 Char. per line.";:GOSUB 490
400 LPRINT CHR$(27);CHR$(49);
410 LPRINT "80 Char. per line.";:GOSUB 490
420 LPRINT CHR$(27);CHR$(50);
430 LPRINT "96 Char. per line.";:GOSUB 490
440 LPRINT CHR$(27);CHR$(51);
450 LPRINT "120 Char. per line.";:GOSUB 490
460 LPRINT CHR$(27);CHR$(52);
470 LPRINT "132 Char. per line.";:GOSUB 490
480 GOTO 550
490 FOR X=32 TO 127:LPRINT CHR$(X);:NEXT X
500 LPRINT:LPRINT
510 LPRINT "THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK."
520 LPRINT "the quick brown fox jumped over the lazy dog's back."
530 LPRINT "The Quick Brown Fox Jumped Over The Lazy Dog's Back."
540 LPRINT:LPRINT:LPRINT:RETURN
550 LPRINT:LPRINT
560 LPRINT CHR$(27);CHR$(77);
570 LPRINT CHR$(27);CHR$(49);
580 LPRINT CHR$(27);CHR$(64);
590 LPRINT "THIS CONCLUDES THE TEST."
600 INPUT "IS THIS THE CHARACTER FONT TO BE ENABLED NOW (Y/N)";A$
610 IF LEFT$(A$,1)="Y" THEN LPRINT CHR$(27);CHR$(76);:ELSE LPRINT CHR$(27);CHR$(77);
620 END
1000 DATA 0,0,0,0,0,0,0,95,0,0,0,7,0,7,0,20,127,20,127,20,36,42,127,42,18
1010 DATA 35,19,8,100,98,56,78,73,54,80,0,0,4,2,1,28,34,65,0,0,0,0,65,34,28
1020 DATA 20,8,62,8,20,8,8,62,8,8,0,64,48,0,0,8,8,8,8,8,0,0,96,0,0
1030 DATA 32,16,8,4,2,62,65,65,62,0,0,66,127,64,0,114,49,113,73,38,33,65,69,75,49
1040 DATA 24,20,18,127,16,39,69,69,69,57,60,70,69,69,56,3,97,9,5,3,54,73,73,73,54
1050 DATA 6,73,73,41,30,0,0,0,0,108,0,0,0,64,36,0,8,20,34,65,0,20,20,20,20,20
1060 DATA 0,65,34,20,8,2,1,89,5,2,62,65,93,85,30,62,65,33,126,32,2,127,73,73,54
1070 DATA 62,67,69,71,32,112,127,35,66,57,54,73,83,69,7,39,83,63,18,1,96,80,79,39,28
1080 DATA 2,127,28,12,127,16,32,79,63,64,0,70,105,127,8,2,127,12,124,35,97,98,62,67,33
1090 DATA 127,2,124,2,127,7,127,1,126,32,62,65,67,62,1,2,127,9,9,6,62,65,97,126,32
1100 DATA 2,127,9,118,32,96,112,79,75,48,39,83,63,1,1,7,63,64,127,32,7,63,64,62,1
1110 DATA 127,32,31,32,127,71,35,28,34,65,7,7,104,127,16,103,83,73,69,35,4,2,127,2,4
1120 DATA 16,32,127,32,16,8,28,42,8,8,8,8,42,28,8,1,1,1,1,1,2,4,0,0
1130 DATA 56,68,36,120,32,64,63,77,50,16,56,68,72,32,0,56,68,68,127,64,88,36,92,64,32
1140 DATA 8,127,109,18,8,8,20,84,124,8,64,127,8,120,32,64,32,58,64,32,0,16,72,125,16
1150 DATA 64,127,40,88,32,64,63,77,34,16,120,4,120,4,120,64,56,4,120,32,56,68,76,56,4
1160 DATA 104,124,20,20,8,8,20,20,124,104,64,60,8,120,32,64,32,68,40,32,64,34,63,66,32
1170 DATA 64,60,64,124,32,64,60,64,60,4,60,64,60,64,60,68,40,56,68,32,24,4,28,80,124
1180 DATA 24,4,92,120,8,8,8,54,65,65,0,0,119,0,0,65,65,54,8,8,8,4,8,16,8
1190 DATA 85,42,35,42,85
```

Computer Lawnmower



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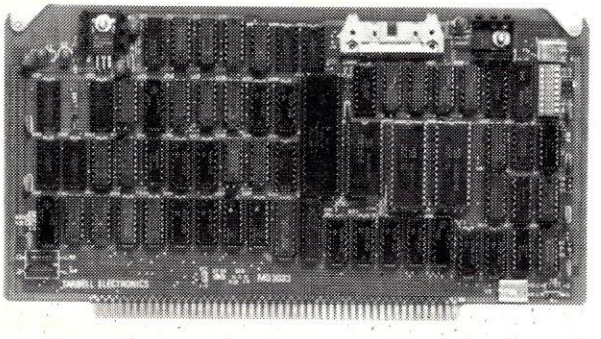

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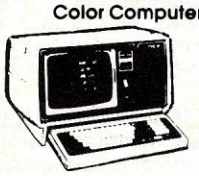

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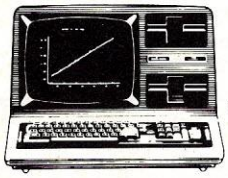

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Columned Output For Word Processors

Nick Jackiw

With the recent boom in the word processing industry, I am surprised to find that many professional standards are overlooked in many of the systems on the market. Of course, offset printing with split-character spacing is not to be expected, but the items which I have never seen, such as the ability to produce the columned format of most newsletters and magazines certainly ought to be available in a market which boasts of programs that can chew tobacco while composing form letters.

Column is an extremely simple program that can easily be modified into a subroutine for your personal processor. Or, if you prefer, you can use it as a separate program. The program prints text in the professional format of two, three, or four columns per page. It was first produced on a PDP-11/34 in Basic-Plus. However, that copy used the extensive file-handling routines found in DEC Basic.

The listing here creates a program which inputs text from the terminal, a page at a time, and processes it. After each page is entered, the columned output appears on the terminal. I leave it to you to modify this program to accept from a second cassette and print on your line-printer, or whatever you have in mind.

The program, less than 41 lines long including REMarks, asks how many columns you want running vertically on the page (two through four, please). After this, it will decide how long each line can be (line 80), assuming you have a terminal with 80 characters. If your terminal is not that wide, you can divide the values of L1 by two. Simply insert the line

```
83 L1=L1/2
```

and the program will work with 40 characters per line.

Nick Jackiw, 6806 Murrayhill Place, Pittsburgh, PA 15217.

The next question Column will ask is how many lines per page you wish. If you are running this so it prints on your CRT, input the number of lines on the screen. If you are using a printer with continuous-paper, simply hit ENTER. Otherwise, type in the number of lines per page. In no case can it be more than 69 lines. The last three lines (67-69) will be blank to advance your printer to the top of the next page.

The program prints text in the professional format of two, three or four columns per page.

Now you are ready to type in your text. Lines 90-140 allow input from the terminal. Each line is checked for length. If it is too long, the program asks you to retype it (see (1) in the sample run). When you have entered a page of text, Column will format your input in columns and print it out, using the routine in lines 500-700. If your text is less than a page in length, type in END** and the computer will print out only what you have entered.

As you can see, Column is very simple. Yet, if you adapt it for your computer, it will give you powers you can't buy anywhere. □

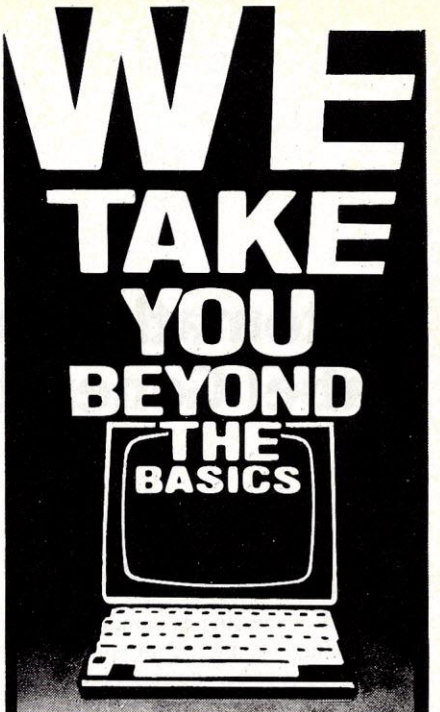
```
Column     16:43
10 REM           COLUMN
20 REM           BY NICK JACKIW
30 REM           SEPTEMBER, 1980
40 REM
50 INPUT "HOW MANY COLUMNS PER PAGE";X0
55 IF X0<2 OR X0>4 THEN PRINT "SORRY,BUT THAT NUMBER HAS TO BE 2, 3, OR 4.":
   GOTO 50
60 INPUT "HOW MANY LINES PER PAGE (HIT 'ENTER' IF UNCERTAIN)";X1:
   IF X1=0 THEN X1=66
65 X1=X1-3:IF X1<2 OR X1>66 THEN PRINT "BETWEEN 5 AND 69, PLEASE.":GOTO 60
70 DIM A$(66),B$(66),C$(66),D$(66)
75 PRINT "PLEASE ENTER YOUR TEXT.  WHEN DONE, TYPE 'END**'.":
   PRINT "THE COMPUTER WILL PRINT OUT EACH PAGE AS IT IS TYPED IN."
80 IF X0=2 THEN L1=35 ELSE IF X0=3 THEN L1=20 ELSE L1=15

85 E$="END**":FOR I=1 TO X1
90 INPUT LINE A$(I):Z$=A$(I):GOSUB 200:IF E0=1 THEN 90
95 NEXT I:FOR I=1 TO X1
100 INPUT LINE B$(I):Z$=B$(I):GOSUB 200:IF E0=1 THEN 100
105 NEXT I:IF X0=2 THEN 500
110 FOR I=1 TO X1
115 INPUT LINE C$(I):Z$=C$(I):GOSUB 200:IF E0=1 THEN 115
120 NEXT I:IF X0=3 THEN 500
125 FOR I=1 TO X1
130 INPUT LINE D$(I):Z$=D$(I):GOSUB 200:IF E0=1 THEN 130
135 NEXT I
140 GOTO 500
199 REM  THIS ROUTINE CHECKS IF THE INPUT LINE IS VALID
200 E0=0:IF LEN(Z$)>L1 THEN PRINT "PLEASE RE-ENTER THAT LINE.":
    PRINT "IT EXCEEDED THE LINE LENGTH OF";L1:E0=1:RETURN
210 IF LEFT(Z$,5)="END**" THEN 500 ELSE RETURN
500 REM          THIS ROUTINE PRINTS OUT THE PROGRAM
505 PRINT:PRINT:PRINT:PRINT
510 FOR I=1 TO X1
515 A$(I)=LEFT(A$(I),LEN(A$(I))-2):
    B$(I)=LEFT(B$(I),LEN(B$(I))-2):
    C$(I)=LEFT(C$(I),LEN(C$(I))-2):
    D$(I)=LEFT(D$(I),LEN(D$(I))-2)
520 PRINT A$(I);STRING$(L1+3-LEN(A$(I)),32);
          B$(I);STRING$(L1+3-LEN(B$(I)),32);
530 IF X0=2 THEN 600
540 PRINT C$(I);STRING$(L1+3-LEN(C$(I)),32);
550 IF X0=3 THEN 600
560 PRINT D$(I);STRING$(L1+3-LEN(D$(I)),32);
600 PRINT:NEXT I
700 IF LEFT(Z$,5)="END**" THEN 32767
710 GOTO 85
32767 END
```

Sample Run.

```
HOW MANY COLUMNS PER PAGE? 3
HOW MANY LINES PER PAGE (HIT 'ENTER' IF UNCERTAIN)? 10
PLEASE ENTER YOUR TEXT.  WHEN DONE, TYPE 'END**'.
THE COMPUTER WILL PRINT OUT EACH PAGE AS IT IS TYPED IN.
? EGGPLANTS
?
?  AS MOST OF YOU
? GOOD CITIZENS AL-
? READY KNOW,  THE
? CITY OF PITTSBURGH
? IS  BEING  INVADED
? BY EGGPLANTS.  THE
? DIABOLICAL PLANTS
? SEEM TO HAVE SPRUNG
PLEASE RE-ENTER THAT LINE. (1)
IT EXCEEDED THE LINE LENGTH OF 20
? SEEM TO HAVE GROWN
? OVERNIGHT IN EACH
? CITIZEN'S GARDEN.
? THE PURPLE AND
? GREEN PLANTS AT
? FIRST WERE, OF
? COURSE, MISTAKEN
? FOR ALIEN BEINGS.
? HOWEVER, IF IT
? MATTERS ANYWAY,
? SCIENTISTS HAVE
? FOUNDED A THEORY

   EGGPLANTS          BY EGGPLANTS.  THE     FIRST WERE, OF
                      DIABOLICAL PLANTS      COURSE, MISTAKEN
  AS MOST OF YOU      SEEM TO HAVE GROWN     FOR ALIEN BEINGS.
GOOD CITIZENS AL-     OVERNIGHT IN EACH      HOWEVER, IF IT
READY KNOW,  THE      CITIZEN'S GARDEN.      MATTERS ANYWAY,
CITY OF PITTSBURGH    THE PURPLE AND         SCIENTISTS HAVE
IS  BEING  INVADED    GREEN PLANTS AT        FOUNDED A THEORY
? ^C
```

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CIRCLE 122 ON READER SERVICE CARD

Automatic Envelope and Label Generation

Glenn A. Hart

Word processing is rapidly becoming something of a microcomputer specialty. Most reasonably sophisticated micro systems have more than enough memory and disk storage capacity for word processing applications; the speed limitations of current systems which can make scientific number crunching inappropriate on a micro do not apply to text handling. The low cost and ready availablity of micro systems, high quality printers and suitable software have also done much to promote this trend.

The software options confronting the word processing user are tremendous. Complete word processors like Word Star, Electric Pencil, Magic Wand, Word-Smith, and many others perform functions previously only available on high priced minicomputers, and excellent separate text editors and output processors like ED-80, Z-Tel, TSC's Editor and Output Processor Text-Writer, Script-80 and others for various processors can also serve admirably.

For all the versatility of these programs, however, all have a major weakness which I find most annoying. Any of the programs mentioned can do a good job preparing correspondence, with some of them also able to handle automatic form letter generation with text substitutions from data files, but *none* can easily prepare the necessary envelopes or mailing labels. Certainly there are ways to do this with most of these programs, but often retyping the addresses or some other tedious method is required.

Another problem is that many micro systems employ printers without keyboards. These receive-only printers are fine for most uses, but prohibit typing envelopes or labels manually.

My answer to these difficulties was to write a Basic program which can interface to many word processors for automatic envelope and/or mailing label generation. The program also handles manual creation of envelopes, return labels or mailing labels, with complete control over spacing and layout for small jobs or for those with receive-only printers.

Glenn A. Hart, 51 Church Rd., Monsey, NY, 10952.

Automatic Processing

Both envelopes and mailing labels can be produced from pre-established sequential data file. Addresses are entered one line at a time, with an empty line separating each address entry. While any text editor or word processor could establish such a data file, and they have their purposes for mass mailings, my goal was to prepare the necessary data file automatically while creating correspondence.

Any word processor which allows the defining of a block of text and writing that block out to disk under its own filename will do admirably. Using MicroPro's Word Star as an example, the sequence to follow is shown in Listing 1. Note that if I am writing several letters in one session, I usually produce only one file, with the letters following one another separated by form feeds. Then use of the command which instructs the word processor to pause between pages for insertion of a new piece of paper allows each letter to appear on its own page. This is not essential, and the program will work as well if individual correspondence files are used.

As each letter is entered into the system, the inside address and the blank line which follows is defined as a block and written to disk with filenames E1, E2, etc. When all my letters have been entered and the word processor exited, these individual address files are concatenated (joined together) with CP/M's PIP utility to create a data file, usually called something like ENVELOPE.DAT. The Basic program, Envelope.Bas, can process such a file automatically to produce the envelopes or mailing labels, or the program can be compiled into a .COM file. with Microsoft's Basic compiler.

```
1) Enter the Word-Star program:          A> WS

2) Enter letters; define inside          ^BMr. Harry Sample
   address as block using the            123 Main Street
   ^K^B - ^K^K sequence, making          Anywhere, U.S.A.
   sure to include the blank
   line following the address.           ^K

3) Write the block to disc as            ^K^WE1
   file E1, E2, etc.

4) When letter entry is complete         ^K^X
   exit Word-Star.

5) Use PIP to combine the files.          A> PIP ENVELOPE.DAT=E1,E2,E3
   (Note that PIP uses a comma to
   concatenate files, not a plus
   sign).

5) Enter the Basic program and           A> MBASIC ENVELOPE
   follow the prompts provided.
```

Listing 1. Procedure for Automatic Creation of Address Data File Under Word-Star.

Program Design

Envelope.Bas is completely menu-driven, and it is only necessary to follow the prompts provided to use it successfully. Three operating modes are available to produce envelopes using a data file, enter envelopes manually or produce various labels. The label mode itself has three modes, for producing multiple return address labels, mailing labels using a data file or manual creation of mailing labels. Upper and lower case entries are allowed,

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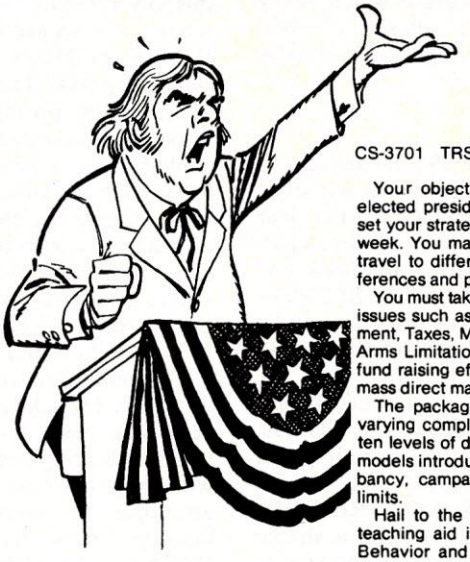
Hail to the Chief



by
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Richard G. Vance

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CIRCLE 300 ON READER SERVICE CARD

error checking is done on all operator-entered responses, and the system should not crash or exit prematurely.

The newest version of Microsoft Disc Extended Basic, Version 5.1 is used. Note that this Basic allows the use of long variable names and some other interesting features which have been used, but there is nothing in the program which really requires any of these niceties. Conversion to other Basic dialects should be reasonably simple.

Program Structure

Lines 10 through 190 initialize the program, define some constants and select the desired operating mode. The clear video screen and printer form feed characters can be changed as required, and any occurrence of CLEAR.SCREEN$ or EJECT$ throughout the program can be replaced with a simple PRINT CHR$(XX) command.

The automatic envelope mode begins at line 1000. The PRINT STRING$(49, 45) statement in lines 1060 merely prints 49 characters with ASCII value 45, or dashes, (An alternate form is STRING$(49, "-") and can be replaced with a simple PRINT command. Subroutine 4000 indicates whatever data files are on the default disk (any file with extension .DAT) and asks the user to choose which one he wants. If a non-existent file is chosen, the error trapping routine at 6000 will explain and re-prompt. (Note that ERR=53 represents the "File Not Found" error.)

Once the data file is open, subroutine 5000 extracts each address. A sample data file with three entries is shown in Listing 2. LINE INPUT #1 is used so that commas

```
Mr. John Smith
123 Main Street
Suffern, N.Y. 10901

Mr. Harry Bigwig
President
Wordwide Industries
75 Broadway
Big City, N.Y. 10000

Miss Mary Doe
75 Broadway
Mainville, N.Y. 11111
```

Listing 2. Sample Address Data File.

or other punctuation can be embedded in the address lines without problems. A string array designated ADDRESS$ is used, with up to six entries or address lines. If your Basic doesn't support string arrays, there is no reason why simple string variables like A$, B$, etc. couldn't be used.

The routine senses the null line following the complete address and completes reading that address. After clearing the screen, the address is shown for verification. The operator is asked to set up the envelope in the printer and indicate he has done so; the envelope is printed and ejected, and the next address is processed. This continues until the End-of File is reached, at which point the "Input Past End" error (ERR=62) is detected by the error trapping routine and processing is terminated. If your Basic does not handle this ON ERROR GOTO error recovery scheme, you should insert the appropriate IF EOF (1) THEN XXXX statement in subroutine 5000. The INPUT$(1) function in line 1100 prompts for a keyboard response of one character; a simple INPUT could be used to prompt for the character followed by a carriage return as well.

The formatting chosen works well with standard business envelopes, but the user can change the constant in line 1140 that spaces down from the return address to the addressee or the tab constants in lines 1150-1200 if desired.

The manual envelope routine begins at line 2000. The address is entered one line at a time, with a null line or carriage return indicating completion. The routine will loop until no additional manual envelopes are required. As before, formatting can be changed if desired. The CHR$(8) in line 2100 merely backspaces over the space inserted by Basic after the line number so the ":" immediately follows.

Label generation begins at line 3000. A menu allows choice of the options available. Preparing labels presents a somewhat different set of problems than simple envelopes. Assuming use of the "one-up" labels for which the program is designed, addresses of differing number of lines required different spacing to reach the top of the following label. Even some rather expensive commercial programs do not acknowledge this problem, so that a three line address followed by a five-line followed by a six-line followed by a three-line, etc. are sure to mess up your labels. Envelope handles this easily by requesting the count of line feeds from the top of one label to the top of the next, keeping track of how many lines appear in each address and skipping the correct number of lines to reach the top of the next label. The program also asks if you want an "offset," or tabbing to specified tab stop to accomodate different types of labels or specific printer requirements. Only "one-up" single labels are handled, but it would be easy to set up formats for multiple labels if required.

The individual label routines start at lines 3300, 3500 and 3600. As usual, formatting can be changed where required. Return labels can be produced in any quantity and mailing labels can be created either automatically or manually.

Possible Enhancements

There are many other ways the program can be used. For example, I used a modified version to generate the envelopes for my Christmas card mailing. The general idea is to add status fields at the beginning of each address listing, detect the code used and process the envelopes accordingly.

In my Christmas list, a STATUS$ field was added to indicate whether the address was known to be correct (OK) or known to be wrong (NG). A newly-corrected address would be indicated by (NEW). The program was modified to read this field and print at the operator's option only those addresses preceeded by either OK or NEW. This allows printing the good addresses once, editing a NG to a NEW when the address is corrected and then printing only the newly corrected envelopes. A program segment (without line numbers) is shown in Listing 3 to give the general idea. A similar field was added to indicate which of two different Christmas cards (with different sized envelopes) was to be sent to each recipient.

```
PRINT "Do you want to print envelopes for addresses known to be"
PRINT "OK or addresses NEWLY corrected? " : PRINT
LINE INPUT "Enter either 'OK' or 'NEW': ", TYP$
---
---
LINE INPUT #1, STATUS$
LINE INPUT #1, ADDRESS$(1)
etc.
---
---
IF STATUS$ = "NG" THEN Skip to Next Address
IF TYP$ = "OK" AND STATUS$ = "OK" THEN Proceed with Processing
IF TYP$ = "NEW" AND STATUS$ = "NEW" THEN Proceed with Processing
```

Listing 3. Module for Adding Status Field Modifications.

It would not be difficult to expand the program to a complete mailing list processor by adding modules for adding, modifying and deleting addresses. A hint: with sequential files, read to the desired address while copying to a temporary file, make the necessary corrections and write them to the temp file, read the remainder of the original file, KILL the original and NAME the temp file AS the permanent file. Switching to random files rather than sequential would further enchance flexibility at the cost of increased programming complexity. □

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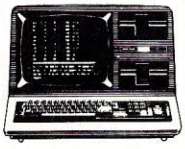

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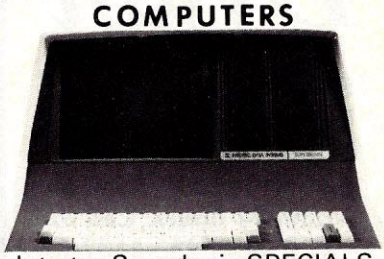

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Generation, continued...

```
10 CLEAR.SCREEN$ = CHR$(26)
20 EJECT$ = CHR$(12)
30 WIDTH 80
40 ON ERROR GOTO 6000
50 PRINT CLEAR.SCREEN$
55 DIM ADDRESS$(6)
60 PRINT "*********************************************"
70 PRINT "*                                           *"
80 PRINT "*     E N V E L O P E   G E N E R A T O R   *"
90 PRINT "*                                           *"
100 PRINT "*********************************************"
110 PRINT : PRINT
120 PRINT "Whcih mode do you want to use:" : PRINT
130 PRINT TAB(10); "AUTO using a pre-established data file"
140 PRINT TAB(10); "MANUAL for individual envelopes"
150 PRINT TAB(10); "LABEL for preparing mailing labels"
160 PRINT TAB(10); "END program operation"
165 PRINT TAB(10); "RETURN to CP/M" : PRINT
170 PRINT "Enter desired mode (A/M/L/E/R): ";
180 MDE$ = INPUT$(1) : PRINT MDE$
190 IF MDE$ = "A" OR MDE$ = "a"
       THEN 1000
       ELSE IF MDE$ = "M" OR MDE$ = "m"
               THEN 2000
       ELSE IF MDE$ = "L" OR MDE$ = "l"
               THEN 3000
       ELSE IF MDE$ = "E" OR MDE$ = "e"
               THEN PRINT : END
       ELSE IF MDE$ = "R" OR MDE$ = "r"
               THEN SYSTEM
       ELSE PRINT : GOTO 170
1000 '
1010 '  *****     AUTOMATIC MODE
1020 '
1030 COUNTER = 0
1040 PRINT CLEAR.SCREEN$
1050 PRINT "THIS IS THE AUTOMATIC ENVELOPE GENERATING ROUTINE"
1060 PRINT STRING$(49, 45)
1070 PRINT : PRINT
1080 GOSUB 4000
1090 GOSUB 5000
1100 PRINT : PRINT "Insert new envelope, hit any key when ready. "; :
     DUMMY$ = INPUT$(1)
1110 LPRINT "Glenn A. Hart"
1120 LPRINT "51 Church Road"
1130 LPRINT "Monsey, New York 10952"
1140 FOR INDEX = 1 TO 7 :
        LPRINT :
     NEXT INDEX
1150 LPRINT TAB(30); ADDRESS$(1)
1160 LPRINT TAB(30); ADDRESS$(2)
1170 LPRINT TAB(30); ADDRESS$(3)
1180 IF LEN(ADDRESS$(4)) = 0
        THEN LPRINT EJECT$ : GOTO 1090
        ELSE LPRINT TAB(30); ADDRESS$(4)
1190 IF LEN(ADDRESS$(5)) = 0
        THEN LPRINT EJECT$ : GOTO 1090
        ELSE LPRINT TAB(30); ADDRESS$(5)
1200 IF LEN(ADDRESS$(6)) = 0
        THEN LPRINT EJECT$ : GOTO 1090

        ELSE LPRINT TAB(30); ADDRESS$(6) : LPRINT EJECT$ : GOTO 1090
2000 '
2010 '  *****     MANUAL MODE     *****
2020 '
2030 PRINT CLEAR.SCREEN$
2040 PRINT "THIS IS THE MANUAL ENVELOPE GENERATING ROUTINE"
2050 PRINT STRING$(46, 45)
2060 PRINT : PRINT
2070 PRINT "Enter addressee one line at a time, up to six lines."
2080 PRINT "Enter two 'RETURNS' in a row to end." : PRINT
2090 FOR INDEX = 1 TO 6
2100     PRINT "Line #"; INDEX; CHR$(8); ": "; :
         LINE INPUT ADDRESS$(INDEX)

2110     IF LEN(ADDRESS$(INDEX)) = 0 THEN 2130
2120 NEXT INDEX
2130 PRINT : PRINT
2140 PRINT "Insert a new envelope. Hit any key when ready. "; :
        DUMMY$ = INPUT$(1)
2150 LPRINT "Glenn A. Hart"
2160 LPRINT "51 Church Road"
2170 LPRINT "Monsey, New York 10952"
2180 FOR INDEX = 1 TO 7 :
        LPRINT :
     NEXT INDEX
2190 FOR INDEX = 1 TO 6
2200     LPRINT TAB(30); ADDRESS$(INDEX)
```

```
2210    IF LEN(ADDRESS$(INDEX)) = 0
            THEN LPRINT EJECT$ : GOTO 2240
2220 NEXT INDEX
2230 LPRINT EJECT$
2240 PRINT : PRINT "Do another envelope (Y/N)? ";
2250 RESPONSE$ = INPUT$(1) : PRINT RESPONSE$
2260 IF RESPONSE$ = "Y" OR RESPONSE$ = "y"
       THEN 2030
       ELSE IF RESPONSE$ = "N" OR RESPONSE$ = "n"
               THEN PRINT : PRINT : PRINT "End of Job." :
               FOR X = 1 TO 2000 : NEXT X : GOTO 50
       ELSE GOTO 2240
3000 '
3010 '  *****     LABEL ROUTINE     *****
3020 '
3030 PRINT CLEAR.SCREEN$
3040 PRINT "THIS IS THE LABEL GENERATING ROUTINE"
3050 PRINT STRING$(36, 45)
3060 PRINT : PRINT
3070 PRINT "Do you wish to" : PRINT
3080 PRINT TAB(10); "Print a specified number of RETURN labels"
3090 PRINT TAB(10); "Generate address labels AUTOMATICALLY"
3100 PRINT TAB(10); "Generate address labels MANUALLY"
3110 PRINT TAB(10); "END the label generating routine" : PRINT
3120 PRINT "Enter desired mode (R/A/M/E): ";
3130 MDE$ = INPUT$(1) : PRINT MDE$
3140 IF MDE$ <> "R" AND MDE$ <> "r" AND MDE$ <> "A" AND MDE$ <> "a"
     AND MDE$ <> "M" AND MDE$ <> "m" AND MDE$ <> "E" AND MDE$ <> "e"
       THEN PRINT : GOTO 3120
3150 IF MDE$ = "E" OR MDE$ = "e"
       THEN PRINT : PRINT "End of Job." :
               FOR X = 1 TO 2000 :
               NEXT X :
               GOTO 50
3160 PRINT : PRINT "How many line feeds from the top of one label to"
3170 INPUT "the top of the next label"; LABEL.SIZE
3180 PRINT : INPUT "Do you want an offset left margin? ", RESPONSE$
3190 PRINT
3200 RESPONSE$ = LEFT$(RESPONSE$, 1)
3210 IF RESPONSE$ = "Y" OR RESPONSE$ = "y"
       THEN INPUT "What offset to use"; OFFSET : PRINT
       ELSE IF RESPONSE$ = "N" OR RESPONSE$ = "n"
               THEN OFFSET = 0
       ELSE GOTO 3180
3220 IF MDE$ = "R" OR MDE$ = "r"
       THEN 3300
       ELSE IF MDE$ = "A" OR MDE$ = "a"
               THEN 3500
       ELSE IF MDE$ = "M" OR MDE$ = "m"
               THEN 3600
3300 '  Generate return labels
3310 PRINT : INPUT "How many return labels do you want"; NUMBER.DESIRED
3320 PRINT : PRINT
3330 PRINT "Align labels, hit any key when ready. "; : DUMMY$ = INPUT$(1)
3340 FOR INDEX = 1 TO NUMBER.DESIRED
3350    LPRINT TAB(OFFSET); "Glenn A. Hart"
3360    LPRINT TAB(OFFSET); "51 Church Road"
3370    LPRINT TAB(OFFSET); "Monsey, New York 10952"
3380    FOR INDEX1 = 1 TO LABEL.SIZE - 3 :
               LPRINT :
        NEXT INDEX1
3390 NEXT INDEX
3400 GOTO 3000
3500 '  Generate automatic labels
3510 GOSUB 4000
3520 GOSUB 5000
3530 LPRINT TAB(OFFSET); ADDRESS$(1)
3540 LPRINT TAB(OFFSET); ADDRESS$(2)
3550 LPRINT TAB(OFFSET); ADDRESS$(3)
3560 IF LEN(ADDRESS$(4)) = 0
       THEN FOR INDEX = 1 TO LABEL.SIZE - 3 :
               LPRINT :
            NEXT INDEX :
            GOTO 3520
       ELSE LPRINT TAB(OFFSET); ADDRESS$(4)
3570 IF LEN(ADDRESS$(5)) = 0
       THEN FOR INDEX = 1 TO LABEL.SIZE - 4 :
               LPRINT :
            NEXT INDEX :
            GOTO 3520
       ELSE LPRINT TAB(OFFSET); ADDRESS$(5)
3580 IF LEN(ADDRESS$(6)) = 0
       THEN FOR INDEX = 1 TO LABEL.SIZE - 5 :
               LPRINT :
            NEXT INDEX :
            GOTO 3520
```


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Generation, continued...

```
3590 LPRINT TAB(OFFSET); ADDRESS$(6) :
     FOR INDEX = 1 TO LABEL.SIZE - 6 :
        LPRINT :
     NEXT INDEX :
     GOTO 3520
3600 ' Generate manual labels
3610 PRINT CLEAR.SCREEN$
3620 PRINT "Enter address one line at a time, up to six lines."
3630 PRINT "Enter two 'RETURN's in a row to end. " : PRINT
3640 FOR INDEX = 1 TO 6
3650    PRINT "Line #"; INDEX; CHR$(8); ": "; : LINE INPUT ADDRESS$(INDEX)
3660    IF LEN(ADDRESS$(INDEX)) = 0
              THEN 3680
3670 NEXT INDEX
3680 PRINT : PRINT
3690 PRINT "Align labels, hit any key when ready. "; : DUMMY$ = INPUT$(1)
3700 FOR INDEX1 = 1 TO 6
3710    LPRINT TAB(OFFSET); ADDRESS$(INDEX1)
3720    IF LEN(ADDRESS$(INDEX1)) = 0
              THEN 3740
3730 NEXT INDEX1
3740 FOR INDEX = 1 TO (LABEL.SIZE - INDEX1) :
        LPRINT :
     NEXT INDEX
3750 PRINT : PRINT "Do another label (Y/N)? ";
3760 RESPONSE$ = INPUT$(1) : PRINT RESPONSE$
3770 IF RESPONSE$ = "Y" OR RESPONSE$ = "y"
        THEN 3610
        ELSE IF RESPONSE$ = "N" OR RESPONSE$ = "n"
                THEN 3000
        ELSE 3750
4000 '
4010 ' *****     OPEN DISC FILE     *****
4020 '
4030 PRINT "DATA files available on this disk: " : PRINT
4040 FILES "*.DAT"
4050 PRINT : PRINT
4060 LINE INPUT "Enter the datafile to be used (.DAT is assumed):
       ", FILENAME$
4070 FILENAME$ = FILENAME$ + ".DAT"
4080 OPEN "I", 1, FILENAME$
4090 RETURN
5000 '
5010 ' *****     GET ADDRESS DATA FROM DISK FILE     *****
5020 '
5030 FOR INDEX = 1 TO 6 :
        ADDRESS$(INDEX) = " " :
     NEXT INDEX
5040 COUNTER = COUNTER + 1
5050 LINE INPUT #1, ADDRESS$(1)
5060 LINE INPUT #1, ADDRESS$(2)
5070 LINE INPUT #1, ADDRESS$(3)
5080 LINE INPUT #1, ADDRESS$(4)
5090 IF LEN(ADDRESS$(4)) = 0
        THEN 5130
5100 LINE INPUT #1, ADDRESS$(5)
5110 IF LEN(ADDRESS$(5)) = 0
        THEN 5130
5120 LINE INPUT #1, ADDRESS$(6)
5130 PRINT CLEAR.SCREEN$
5140 PRINT : PRINT
5150 PRINT "ADDRESSEE"; COUNTER; CHR$(8); ": " : PRINT
5160 FOR INDEX = 1 TO 6
5170    IF LEN(ADDRESS$(INDEX)) = 0
              THEN PRINT "-" : GOTO 5190
5180    PRINT ADDRESS$(INDEX)
5190 NEXT INDEX
5200 RETURN
6000 '
6010 ' *****     ERROR TRAP ROUTINE     *****
6020 '
6030 ' To detect and handle End-of-File when reading
6040 ' sequential files for automatic processing and to
6050 ' correct File Not Found errors
6060 '
6070 IF ERR = 62
        THEN CLOSE : PRINT : PRINT " End of Job." :
             FOR X = 1 TO 2000 :
             NEXT X :
             RESUME 40
6080 IF ERR = 53
        THEN PRINT : PRINT "You have chosen a non-existant DATA file." :
             PRINT "Re-enter, making sure to use CAPITALS
                                                 for the filename. " :
             PRINT : RESUME 4030
6090 ON ERROR GOTO 0
6100 RESUME 40
```


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Part 2

Atari Graphics Unveiled

David and Sandy Small

In Atari Graphics Unveiled, Part 1, (Creative Computing, *June 1981) the authors began an exploration of the mysterious world of Atari graphics. This month we learn more—beginning with "The Dark Secrets of Antic."*

Let's take a moment and review quickly what we covered in Part 1.

There are are 192 horizontal lines on the screen, each composed of 320 dots. The lines are stacked vertically and are traced left to right, top to bottom. Each dot can be set to a given color/lum. This information is stored in memory in the Atari in one of two ways, either by character addressing (where we define a character by assigning a number to it) or by bit-mapping, where a group of dots or one dot is represented by a bit memory as on or off. If we bit-map in memory, we mustn't represent that data as character-addressed, and vice versa, otherwise we'll get random litter on the TV.

This brings us pretty well up to date. Now let's get away from all this software and programming talk and consider the Atari hardware for a moment.

The Dark Secrets of Antic

The main processor of the Atari is called a 6502. The 6502 executes 1.7 million instructions per second, which is pretty fast by human reckoning. But refreshing the TV screeen involves telling it the color and lum for 3.7 million dots each second, so you can see the 6502 would have quite a time keeping up. (192 x 320 x 60 = 3.7 million). The engineers who designed the Atari knew the 6502 would be busy with other jobs anyway, like running Basic programs, and decided to give it some help. The help is in a very powerful, fast, and dumb slave computer called Antic. Antic lives (?) to do Atari displays and is actually a microprocessor himself.

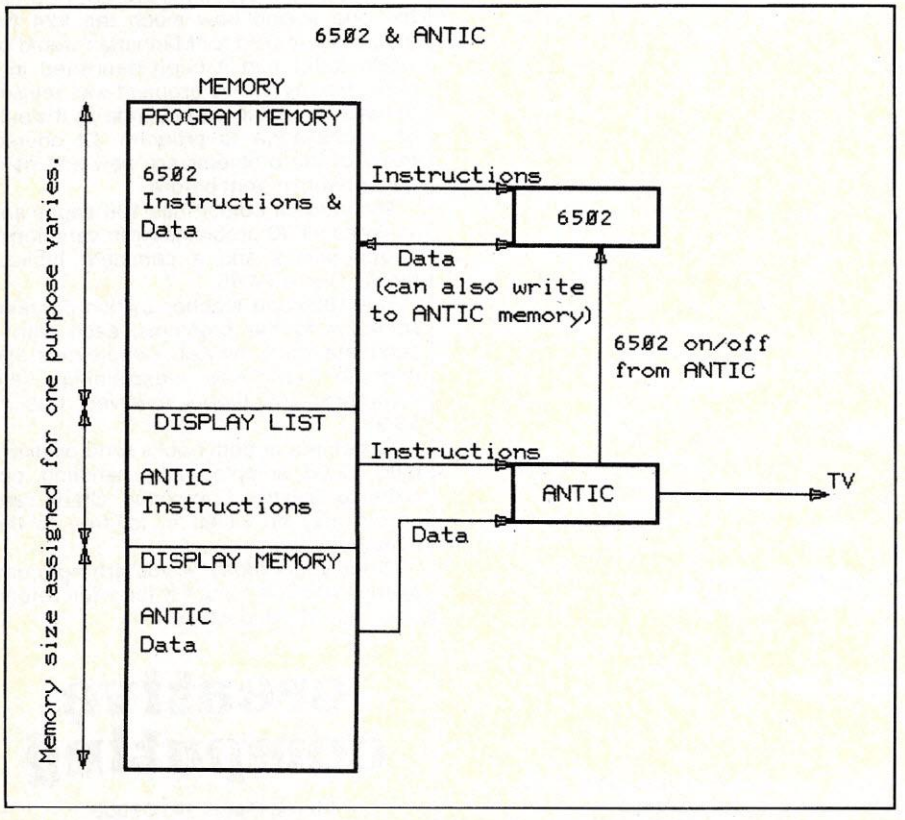

Figure 1.

Now any computer has a memory and a processor; the processor gets its instructions and data from memory, and writes its output, once it is done crunching, to that same memory and the outside world. The Atari has such demands put on it by this screen refresh business that it comes equipped with two microprocessors, the 6502 and Antic, to handle the load. Antic takes care of display work, and the 6502 handles everything else. The 6502 is programmed in 6502 machine language, and the Antic processor is programmed in Antic machine language. They both share the same memory and must split it up between them. To give you an idea of how the work is shared, the 6502 places READY and some instructions in Antic's area of the main memory (remember the 6502 and Antic share memory), and then tells Antic to get to work. After that, Antic handles the screen refreshing (getting the READY to the TV) all by himself. (See Figure 1.)

In order to introduce you to a word, "DMA", I'm going to point out that even fast Antic has to move right along to keep up with that 3.7 million points per second. Since he and the 6502 share memory, there is a possibility that both will need something from memory at the same time. Both can't access the memory simultaneously. So in order to prevent Antic from falling behind, it will turn the 6502 off completely until it is finished with its memory needs. (How's that for a "slave"?) It then accesses memory as fast as it can, gets done, and turns the 6502 back on to get back to work. This is known as "cycle stealing" (for it steals the memory out from under the 6502), or Direct Memory Access (DMA).

Books on 6502 machine language are plentiful, but books on Antic machine language, which is a language devoted to display generation, are not available. A set of instructions, as you know, is called a "program"; a program in Antic assembler is called a Display List.

Since Antic handles everything having to do with displayed "playfield images" (characters or lines), it seems reasonable that we'll have to re-program it to get mixed modes on the screen. Thus we have to write a new program for it, a new "display list." For those of you who have seen a book on 6502 machine language, and are bewildered, don't worry; display list programming is pretty easy. Don't confuse display memory and display list,

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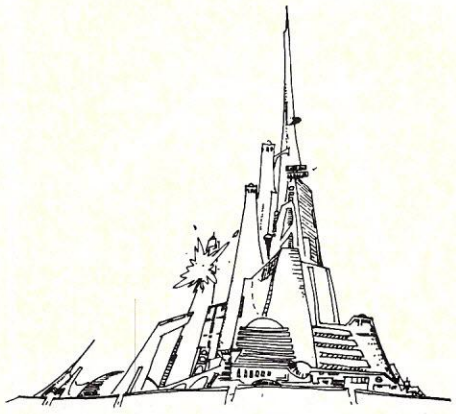

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however, for they are different things. Display memory is where we actually store items to go on the screen, and the display list is a set of instructions for Antic to tell him how to interpret that data.

A display list instruction is generally concerned with a "display block," which refers to a variable number of the 192 horizontal scan lines onscreen. (There are other display list instructions, but we'll ignore them for now). Remember graphics 0, where characters are eight scan lines tall? Its display block height is eight lines. Graphics 8, with its single scan line tall dots, has a display block size/height of one scan line. A "display block" refers to the number of scan lines generated for each display memory location, vertically.

Let me go over that to make sure it's clear. Remember how a character can be eight or 16 scan lines tall in graphic mode 0, 1, and 2 and how a graphics "point" can be between one and eight scan lines tall (3-8)? That height is what a display block is. It takes one memory location to span eight horizontal scan lines in the "R" of "READY," right? Hence the graphics 0 display block is eight lines tall. It takes one memory location to be one line tall in graphics 8, so its display block size is one.

Basic Graphics Mode	Size of Display Block	# Vertically Stackable
0	8 v lines/char	24 vertically stacked
1	8 v lines/char	24 vertically stacked
2	16 v lines/char	12 vertically stacked
3	8 v lines/point	24 vertically stacked
4	4 v lines/point	48 vertically stacked
5	-same-	
6	2 v lines/point	96 vertically stacked
7	-same-	
8	1 v line/point	192 vertically stacked

Table 1.

Shortly, we'll be expanding on Table 1, which covers the different display block sizes. You'll find it matches the back of the Basic manual in some ways.

Now let's say we'd like to draw a graph, titled in big letters and subtitled in smaller letters, with labels on the axes and a caption underneath it. You could do it by constructing individual dots in patterns to make up letters, but you would be much older by the time you finished. Fortunately, the Atari engineers thought of a better way, and we're going to learn about it.

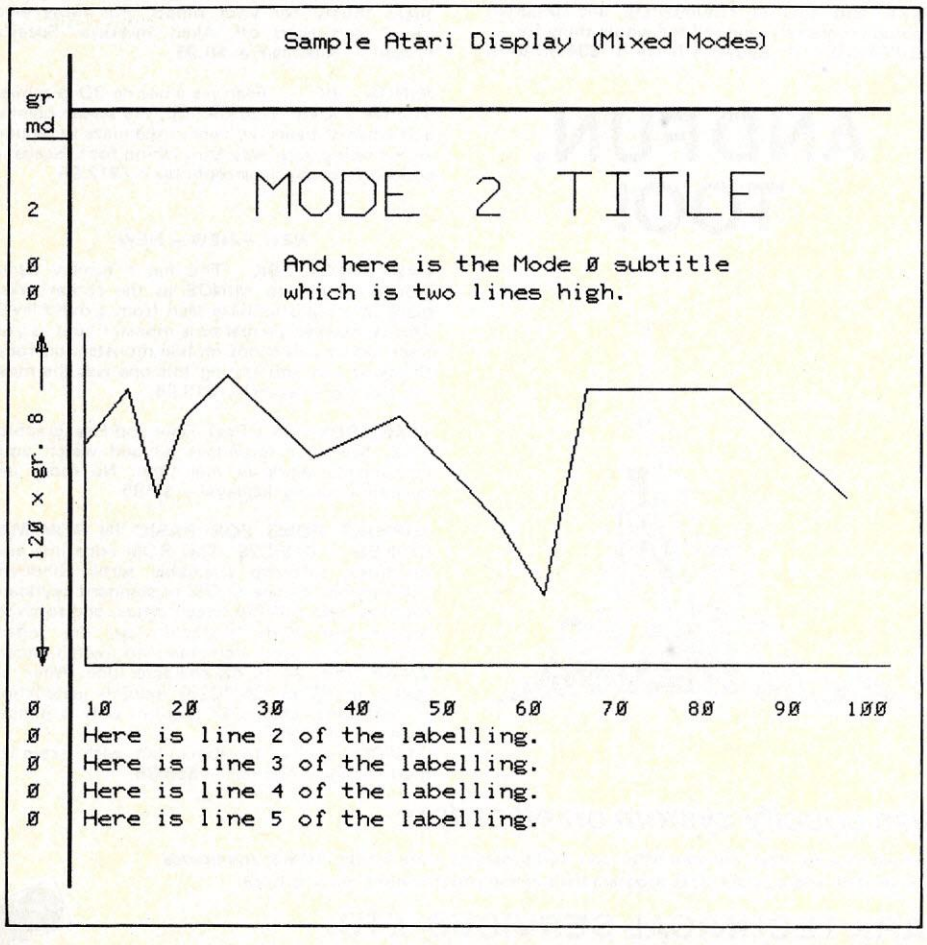

Figure 2.

You can mix graphics modes, so you might as well forget about the Basic manual saying you can't. From here on, by the way, we leave the Basic manual behind.

Display blocks are always stacked vertically, on top of each other. Memory-stored screen images are stored and displayed in display blocks. For example, a screen full of text is what is displayed with graphics 0 display blocks, 24 of them, stacked vertically. A display block extends all the way across the screen, and cannot be changed midway through a line.

This is very important. A display block is a group of horizontal scan lines of varying number. What does not change is that if a given dot is in a given graphics mode, the ones to its side are in the same mode. Thus a display block can be thought of as a thin horizontal bar. Here is the key to the importance of the display list: while any given display block has the same graphics mode horizontally across the screen, the graphics modes above and below it do not have to be the same. Display blocks make up our video picture, and are stacked on top of each other, no matter how tall any one may be.

This means that in our graph we "stack" a line of graphics 2 characters (the title) on top of two lines of graphics 0 characters (the sub-title), which in turn are on top of many lines of graphics 8 dots/lines, which finally are on top of some more graphics 0 lines, the labelling. (See Figure 2.)

Now let's follow Antic through a normal screen refresh to see what he does. Let's assume graphics 0 with "READY" in the top left corner. He realizes it is time for a screen refresh. He needs to know what to put in the top left corner of the screen, which is what he must plot first. He looks to his display list, stashed away in memory, for help. "The first horizontal scan lines from the top are in graphics 0," he mutters to himself. So he then goes to display memory, saying, "Since there are 40 characters per line in this mode, we need 40 bytes of memory," and grabs 40 bytes from display memory. He than remembers that since this is graphics 0, the numbers he has in the bytes actually represent

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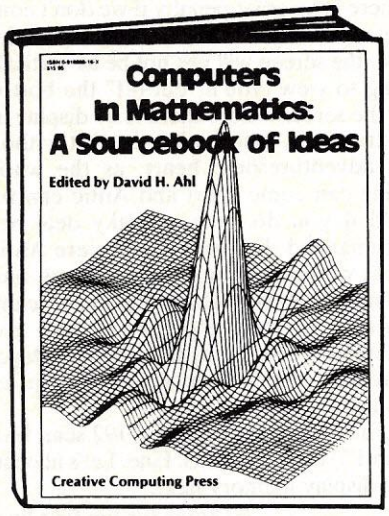

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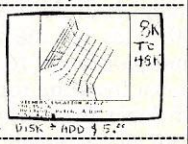

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characters, so he ambles off, finds the shape table, and finds out what each character is for each number. "R,E,A,D,Y, and 35 blanks," he finds out, for the first display block at top screen. Over the next eight scan lines, he puts up the first display block—the word "READY." He then consults his display list again to see how tall the next display block is, finds it to be in graphics 0, and proceeds. Hence, he has 24 display blocks, and 24 display list instructions, for there are 24 rows of characters on the TV screen. If we're in graphics 8, Antic must look at the display list 192 times, for there are 192 graphics 8 display blocks on the screen; remember each graphics 8 display block is one scan line high, and there are 192 scan lines.

Let's say we get clever and try to confuse Antic. First we make a graphics 2 instruction on his list, then two mode 0's, then a bunch of 8's. What will he do? He will faithfully fetch 20 bytes for the first line, plot it up onscreen at the top, 16 scan lines high. (You can see a table of these things is useful.) Next, he'll fetch 40 and 40 bytes for the two graphics 0 blocks and plot them, 16 lines and then 24 lines down from the top (because he's already 16 down, from the graphics 2 block). Next, he'll do a bunch of graphics 8 display blocks, and so on. You may recognize the example as that of our graph, and this is how we mix display modes on one screen.

Clearly you have to map out your displays and your display memory in advance. Since display memory is "stacked," too, you must have the right number of bytes reserved for each display block (which we will put in a table shortly), or things will foul up, for Antic knows where he is in the display memory only by how far he's moved down it since the start of the screen refresh.

To clear this up, let's go back to our example. A line of graphics 2 characters takes 20 bytes of memory (this means you can fit only 20 graphics 2 characters side by side onscreeen, because they are so big). Since we are at the top of the screen, they are at the start of display memory. Antic plots them and while doing so, moves forward 20 bytes in display memory. The next 80 bytes of display memory are for the first of two graphics 0 lines, each of which take up 40 bytes per line. If there are only 20 bytes of data for that line, by our mistake, Antic will still use 40. It then moves down the 80, to the first graphics 8 line. Now it is 20 + 40 + 40 = 100 bytes deep into display memory. It next encounters graphics 8 display blocks, bit mapped. There are eight bits per byte, and 320 points per line, so there are 320/8=40 bytes per line in graphics 8. It will move down another 40 bytes for each graphics 8 line it encounters.

Antic does *not* know where you start and end your lines in display memory except by where he is when he needs more data; the possibilities for mistakes are endless. If you leave too little or too much data per line, Antic doesn't know better, and the effect will move down the screen from the point of error, giving really odd displays. This can cause bit-mapped data to be mistaken for character data. Later we'll actually demonstrate this. We must remember to have the right stuff in display memory before we turn Antic loose with mixed graphics modes.

Obviously this isn't bad when there is a fixed number of bytes per block, for the entire screen, as happens when Basic graphics modes are used. Do you begin to see why the Atari engineers made the graphics modes the way they did? It makes things considerably easier for them.

Just for practice, for you'll have to do this every time you fiddle with the display list and blocks, let's get up a sample display list and associated display memory for our graph.

See Figure 2 for a layout of our graph. There are 192 lines available to use, and we'll set them up as follows:

16 x 1 =	16	lines in graphics 2 for our title
8 x 2 =	16	lines for graphics 0 subtitle
120 x 1 =	120	lines for graphics 8 dots/lines (the graph itself)
5 x 8 =	40	lines for graphics 0 labels
	192	scan lines

There is no great penalty if we don't come out at exactly 192 lines; if there are a few less, the screen will just not be as vertically long to view (you'll "cut off" the bottom of the screen where there is no display list instruction). Just don't exceed it without an adventuresome heart, as the whole thing can come apart and Antic can run wild if you do. It is a shaky deal best summarized this way: If you were Antic, what would you do if you were still busy doing a refresh when the order came through to start another? (It can give interesting effects, by the way, which you may find depend on what TV you are using).

Thus, we have allocated 192 scan lines with 173 display blocks. Fine. Let's allocate the display memory next:

	20	bytes for the first line
40 x 2 =	80	bytes for the second two lines
40 x 120 =	4800	bytes for the 120 graphics 8 lines
40 x 5 =	200	bytes for our graphics 0 labels.
	5100	bytes total

To get our display onscreen, we then set up display memory with the data needed (modes 0 and 2 are character addresses,

Graphics Mode	X Pts	Y Pts	Lines/ DB	# Bits/ Point	Pts/ Byte	D Mem Length	D List Length		RAM req'd (DM+DL)	RAM /1 Disp Bl
0	40	24	8	8	1	960 +	24	(+9) =	993	40
1	20	24	8	(8)	1	480 +	24	(+9) =	513	20
2	20	12	16	(8)	1	240 +	12	(+9) =	261	20
3	40	24	8	2	4	240 +	24	(+9) =	273	10
4	80	48	4	1	8	480 +	48	(+9) =	537	10
5	80	48	4	2	4	960 +	48	(+9) =	1017	20
6	160	96	2	1	8	1920 +	96	(+9) =	2025	20
7	160	96	2	2	4	3840 +	96	(+9) =	3945	40
8	320	192	1	1	8	7680 +	192	(+9) =	7891	40

Table 2.

A few notes examining this table should make its function clear.

If we store eight points per byte, we're using only one bit to tell color, hence the two-color mode. Four per byte implies two bits for each color. Modes 0 and 8 don't save a color register.

We add nine to each DL (display list) length to handle added stuff in the display list, covered in the previous example. The display memory pointer and top vertical blank are all the same, as is the jump and wait refresh. This adds up to nine bytes.

Hence, in mode 5, information is packed into display memory with four points per byte, two bits dedicated to each point, each pointing to a particular color register. Remember Antic has to have his display data in the correct order and length, also; this is why this table can be so handy. It enables you to figure out the memory requirements for a given display block at a glance.

Modes 1 and 2 have their color storage mechanism pretty well covered in the manual (the top two bits of any byte determine color, the remaining six determine the actual character). See the graphics section of the Basic manual for details on these.

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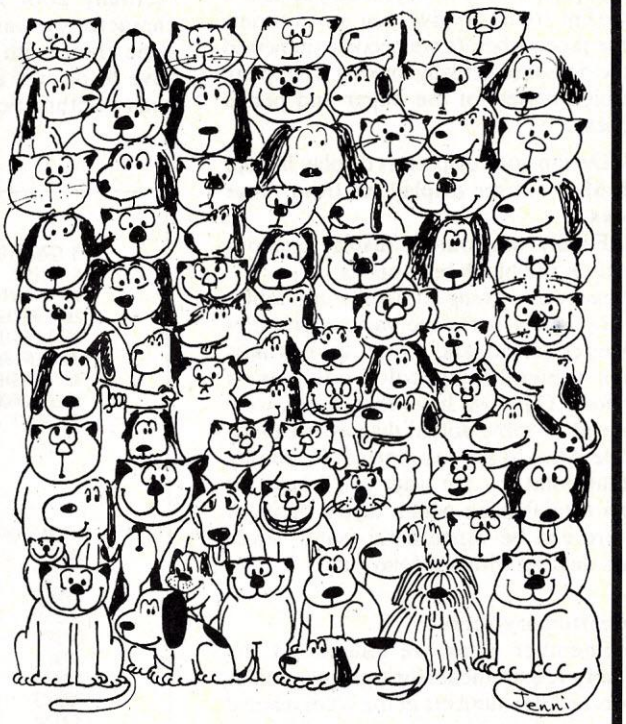

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whereas mode 8 is a bit map, remember, so we need to set it up appropriately), then set up our display list with its 173 graphics instructions, then tell Antic to start executing it. He will, and your display will pop up on the TV, just as you laid it out. (I'm trying to give you an overview of the process before we become immersed in the details of actually making it happen). A quick review of the paper and pencil process:

1. Design your display as display blocks
2. Map out the display list from those blocks
3. Finally, map out the display memory based on the block byte needs.

Next, we're going to need some tables on how many bytes the various graphics modes consume, and a brief look at how much remembering color costs us in memory. Once we have that down, we'll proceed to some actual display list mods on the Atari to get you started. Hopefully at that point, by the way, you'll have an Atari available on which to try them. A picture can be worth a thousand words when dealing with a display list.

More Memory Secrets

Remember when we calculated the memory requirements for a given graphics mode, and the numbers in the Atari manual came out a little over our predictions? We now know where that memory went: the display list. Let's recalculate the graphics 0 memory requirements with the display list in mind this time.

A graphics 0 display list, as we shall shortly see in real life, looks like this:

- 3 bytes which instruct ANTIC where to find the display memory
- 3 bytes which instruct ANTIC to leave the very top of the screen blank
- 24 bytes which instruct ANTIC that there are 24 graphics 0 display blocks
- 3 bytes which instruct ANTIC to wait for the next refresh to start, then go to the top of the display list and start all over.

33 bytes

Add this to the (40 x 24 = 960) bytes of the raw display memory requirements, and you'll have the 993 bytes that the book shows. Incidentally, generally the display memory begins right after the last display list instruction (the Jump and Wait for Vertical Blank, it is called), but it doesn't have to. You can carry out this same calculation, just like the people who wrote the book, for any graphics mode.

Next, since we're cleaning up loose ends, we'll have to consider color. I've deliberately put this off until the display list was pretty well explained to avoid barraging you with too many concepts at once. Depending on the graphics mode, we have a variable number of colors available to select from to light a given character or point.

There are 16 colors available (0-15). Remember how, instead of saving all the information about a given character, we just saved a number and let the Atari (actually poor Antic) figure out what character we wanted from it? We do the same thing with colors. We're going to have to discuss a small amount more of binary arithmetic, so hang on.

Imagine you have a pen and graph paper. Now you can put numbers in the squares on the paper, but only one digit per square. How many numbers can you show with one square? Only 0-9, no more will fit. If you have two squares, you can fit 00-99. Thus, the numbers you can represent are limited by the number of available squares you have in which to display them. Well, the same thing is true with bits and bytes, the numbering system is just different. With eight bits, you can only represent

Program 1

```
5 GRAPHICS 0
6 PRINT "READY"
10 START=PEEK(741)+256*PEEK(742)
20 LPRINT "START OF DL=";START
25 LPRINT "ADDR    (1 BYTE)   (2 BYTE)"
30 FOR ADDR=START TO START+50
40 LPRINT ADDR,PEEK(ADDR),PEEK(ADDR)+256
*PEEK(ADDR+1)
60 NEXT ADDR
```

```
START OF DL=39967
ADDR    (1 BYTE)   (2 BYTE)
39967     0          28672
39968     112        28784
39969     112        28784
39970     112        17008
39971     66         16450
39972     64         40000
39973     156        668
39974     2          514
39975     2          514
39976     2          514
39977     2          514
39978     2          514
39979     2          514
39980     2          514
39981     2          514
39982     2          514
39983     2          514
39984     2          514
39985     2          514
39986     2          514
39987     2          514
39988     2          514
39989     2          514
39990     2          514
39991     2          514
39992     2          514
39993     2          514
39994     2          514
39995     2          514
39996     2          16642
39997     65         8257
39998     32         39968
39999     156        156
40000     0          0
40001     0          12800
40002     50 R       13618
40003     53 U       11829
40004     46 N       46
40005     0          0
40006     0          0
40007     0          0
40008     0          0
40009     0          0
40010     0          0
40011     0          0
40012     0          0
40013     0          0
40014     0          0
40015     0          0
40016     0          0
40017     0          0
```

```
START OF DL=39967
ADDR    (1 BYTE)   (2 BYTE)
39967     0          28672
39968     112        28784
39969     112        28784
39970     112        17008
39971     66         16450
39972     64         40000 D.M.
39973     156        668
39974     2          514
39975     2          514
39976     2          514
39977     2          514
39978     2          514
39979     2          514
39980     2          514
39981     2          514
39982     2          514
39983     2          514
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39985     2          514
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39987     2          514
39988     2          514
39989     2          514
39990     2          514
39991     2          514
39992     2          514
39993     2          514
39994     2          514
39995     2          514
39996     2          16642
39997     65         8257
39998     32         39968 ↑ JVB
39999     156        156
40000     0          0
40001     0          12800
40002     50 R       9522
40003     37 E       8485
40004     33 A       9249
40005     36 D       14628
40006     57 Y       57
40007     0          0
40008     0          0
40009     0          0
40010     0          0
40011     0          0
40012     0          0
40013     0          0
40014     0          0
40015     0          0
40016     0          0
40017     0          0
```

Figure 3. Result of printing to the screen.

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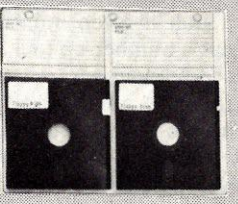

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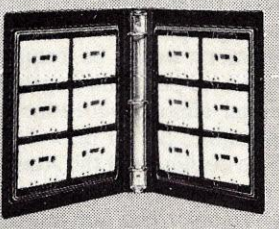

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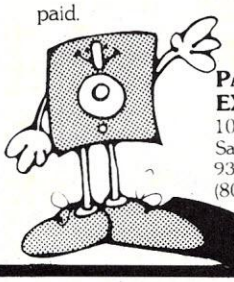

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the numbers 0-255, just as you can only represent 0-999 with three "decimal" digits. With one bit, you can represent just 0 or 1 in the computer's number system. This analogy should allow us to proceed if you accept the fact that a given number of bits can represent a number up to a limit. That's all you need remember.

Now, if we save the color number of each point, representing the numbers 0-15 (the number of colors available) takes four bits, and the illumination (brightness) level takes three bits, we use seven bits total per point. If we calculated how much memory would be required if we used one byte per point in graphics 8, it would equal almost the entire memory of the machine! So we must find a better way. The designers of the Atari did it this way: they set up five "color registers," which store color and lum information in them. Next, instead of saving color and lum with each point, they save a number from 0 to 4, which tells Antic what color register to use to display for this point. The graphics modes available use as many as five of the five registers, or as few as one. We'll have to examine them individually to understand how the register information is saved for each.

So, when Antic looks at a point and sees a "01" as its color, instead of assuming it is color #1, he looks instead to color register #1, where he'll find the color and lum information for that point. The memory savings are very large; that's why Atari did it this way.

Graphics modes 0 and 8 don't have colors saved in their character/bitmap data. Rather, all eight bits are used in graphics 0 to determine which character is to be displayed, and all eight bits are used in graphics 8 to display memory, since there is only one color in graphics 8, with the bits determining a bright or dim point of that particular color. This is why calculating their memory requirements was easy. Let's find out how much memory it requires to save two or four colors, since these are the choices Atari gives us in graphics modes 4 and 6, or 3, 5, and 7, respectively.

Bit Pattern	1 Bit	2 Bits
Color #1	0	00
Color #2	1	01
Color #3		10
Color #4		11

Since bits can only be 0 or 1, these cover all the possible combinations. In short, one bit can save two different colors, or two bits can save four colors. Graphics modes 3, 5, and 7, (four colors) thus use two bits to save the color register of each point, and modes 4 and 6 use only one bit. We'll see shortly that modes 4 and 6 use less memory for the same number of points as their 3, 5, 7 counterparts, because they use only one bit, not two.

Examining the Display List

Well, enough theory! You undoubtedly want to see the display list in action, and I just wanted to be sure I didn't frighten you out of using it. Remember this, however: display list instructions are merely numbers, and they do not necessarily correspond to what we think the function of that number ought to be; for example, a "2" does not tell Antic to shift to mode 2 for this display block. Also, Antic instructions are either one or three bytes long. The one-byte instructions deal with a display block, while the three-byte instructions deal with memory addresses. Why? Remember our discussion of how large a number may be saved in a byte? (0-255.) Well, if we use 16 bits, or two bytes, we can store any number from 0-65535. Your Atari has exactly 65,535 bytes of addressable memory locations, and that is the reason why. Since Antic needs to be able to go anywhere in memory, we use two bytes to tell the address (16 bits). By the way, since there are 256 possible numbers in byte, that's the maximum number of instructions that Antic can have, unless very sophisticated techniques are used.

One instruction I'll tell you about now is the "2." It tells Antic that this display block is to be displayed in graphics 0, and we'll be seeing a good deal of it.

Please enter and run Program 1. If you have no printer, change the LPRINTs to PRINTs, and the data will be displayed onscreen.

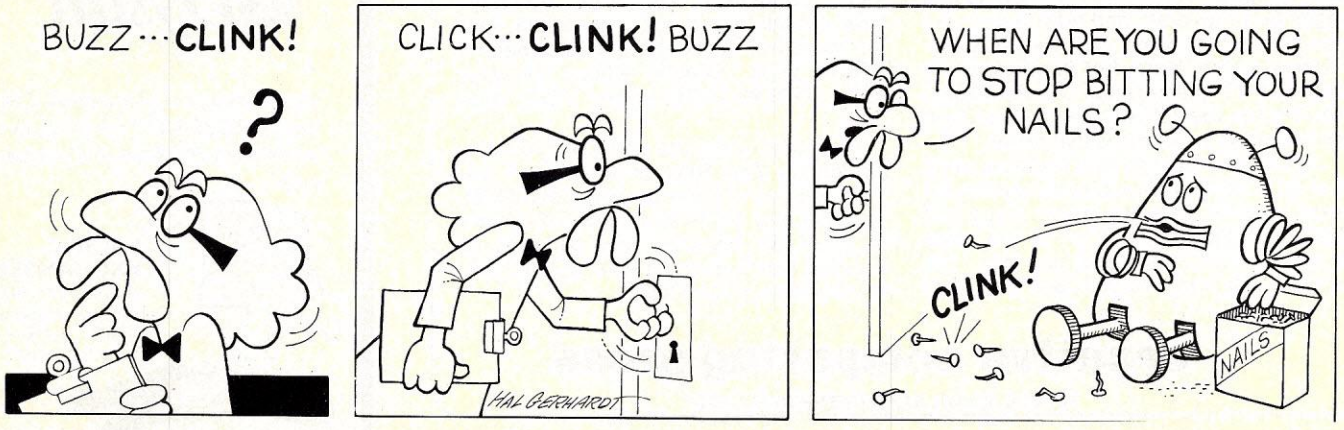
What you'll get from the program will look a good deal like what is shown in Figure 3, which is a copy of what I got. If you type it in the same way I did and if you have the same amount of memory, it will be identical. Now, let's take a look at the program and find out how it works.

Line 10 looks at two locations in memory, 741 and 742. Remember when we said our memory could have 65,535 separate bytes? Well, each one can be individually examined or modified via the PEEK and POKE Basic statements. Supplying the byte number from the beginning of memory (byte #0), or the "address," tells Basic where in memory to look. Line 10 examines bytes 741 and 742, two bytes, which are used together to give a 16-bit number (from 0-65,535—remember?). This place, locations 741 and 742, is where Antic looks when it asks, "Where in memory is the display list?" The locations contain the address in memory of the beginning of the list. PEEK gives us the contents of that address.

Hence, line 10 assigns the variable START to the place in memory where the DL begins. We print that information in line 20 and a title in line 25. In lines 30, 40 and 60, we print the memory location and contents of that location for memory from the start of the DL continuing for 50 locations. Hence, examining our output, we can see byte #39967 contains a 0, the next byte a 112, and so. The third column of numbers contains a 16-bit, or two byte, interpretation of the contents, rather than

Buzzy

Hal Gerhardt



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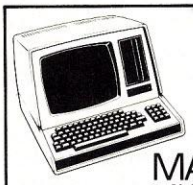

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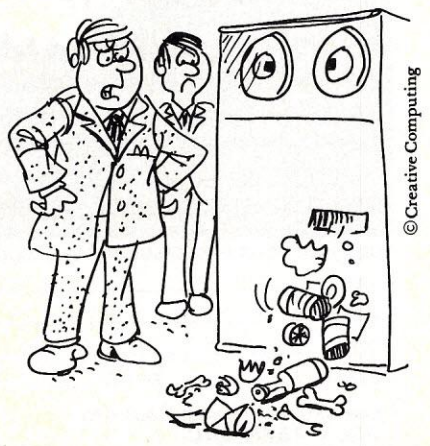
an eight-bit (one byte) interpretation. This is because we are "exploring the unknown" and we'll see both eight- and 16-bit addresses, so we need to have both interpretations handy.

The display list, as I mentioned before, has both one- and three-byte instructions. Three-byte instructions generally have something to do with 16-bit addresses and one-byte instructions generally have something to do with display blocks. I've marked the two three-byte instructions so they stand out. The arrows point to the 16-bit addresses in the third column; ignore the rest of the 16-bit column (as does Antic—it doesn't interpret data in other than those two locations as two-byte addresses). Also, the print-out extends farther in memory than the display list does, which will be very helpful in a few moments. Let's start at the top of the display list and work down to find the meaning of the data. By the way, if you use less memory in your Atari than I do in mine, the addresses you have will be different. No matter; everything below can be applied to a lower memory Atari if you'll just change the addresses consistently with the example. The display list is a program, executed sequentially, just like Basic; the memory addresses might be considered line numbers.

The first byte is a 0. Ignore it. The next three bytes are all 112s. If you can imagine a display block whose purpose is to display nothing but a blank screen, ignoring memory, you have a good idea what these lines are for. These lines leave a margin above and below the visible area on the TV screen so in case your TV is out of adjustment, the displayed images won't be offscreen. The next three bytes are one instruction. They tell Antic where to find the display memory, where we'll actually store what goes onscreen. The next 24 bytes (remember, 24 lines in graphics 0) are display list graphics 0 instructions. They tell Antic to display 24 graphics 0 display blocks. Finally, the last instruction in the DL is also a three-byter; it tells Antic to stop and wait for the next screen refresh to come. (This instruction is called JVB for Jump and wait for Vertical Blank.) This is a lot like the GOTO statement in Basic. The address it "goes to" is the 16-bit address to the right—39968. If you look back, you will see 39968 is the start of the display list plus one, skipping the first byte, which I asked you to ignore. Now look back to where we tell Antic where display memory is located (bytes 39971-39973). The 16-bit address is 40000, which is directly after the end of the display list.



"Why must you ignore the gigo principle?"

"Well," you say, "if that's the display memory, shouldn't it reflect what is on the screen at that moment?" It does. The listing to the left reflects what you will have. The bytes in 40000 and 40001 are 0's, which are blanks to the Atari (this is the left margin). Bytes 40002-40004 reflect three characters onscreen at the exact moment the PEEK was executed. They are the letters "R," "U," and "N," that you typed in to run the program, still onscreen and thus in display memory! If we were to look farther into display memory, by the way, we would find that the first 40 bytes are the contents of line one, the second 40 would be the contents of line two, and so forth. (By the way, if you didn't use the printer, and instead printed the information to the screen, the letters "RUN" would disappear in normal screen scrolling, and thus these numbers for the contents of memory wouldn't be the ones you would get. Rather, they would reflect what you had onscreen at that moment, which would be the numbers displayed by the program.)

If you are running less memory, you will find all the addresses changed. You will still find the display memory right after the display list, and the Antic JVB three-byte and "Where is display memory?" instructions, the addresses will just be lower. Everything is identical otherwise, so if I ask you to modify the display list or memory, just shift the addresses appropriately. Since you ran this program, you now know where they are both located in your Atari.

Now, let's have some fun. First, let's prove to ourselves that these numbers in display memory (not the list) really mean something. Pick a location in your display memory (which starts where Antic is told it starts, in the first three-byte instruction in the display list—in our example, 40000). A good example would be 40100, or 100 bytes into display memory.

Now in graphics 0, memory location 40100 contains the location of a definite character onscreen. Where? Well, if each line has 40 bytes dedicated to it, the location of the character is midway through the third line down. Let's put something into that location. If we do, Antic will interpret it as a character and display it onscreen as soon as it gets into memory (Antic does a refresh every 1/60th of a second). There is an instruction to modify memory directly: the POKE instruction. It places the value you specify into the memory address. Type: POKE 40100,46 (return). This puts a 46 into byte #40100.

An "N" will have appeared magically on the third line down the screen, about half way across. "N" is the Atari character represented by 46. If you have a different memory size than mine, don't worry. Find the start of your display memory by running the program and finding the three-byte Antic instruction. It will be in the fifth through the seventh lines of the printout—always. Let's say the 16-bit address listed on line 6 by the 16-bit conversion is 17250. That means that 17250 is the first byte of display memory. To go 100 bytes further down, just add 100. So you'd type POKE 17350, 46 (return).

Pretty neat, eh? Move around in memory a bit from the start of display memory to the end, which you will recall is the start plus 960 (the length of display memory in graphics 0; see Table 2). Try POKE-ing in the 46 at different spots in this range, and you'll have Ns appearing all over the screen. Try changing the 46! You will get all sorts of oddball characters wherever you POKE something. Be careful, though, that you don't go outside the range of the display memory. It can foul the Atari up and require you to RESET or turn it off/on if you accidentally POKE in the wrong location. There is also a limit on the highest number you can POKE into a byte. Can you guess what that is? That's right: 255 is the highest number there is room for in a byte.

After you've spent some time playing in display memory (the more adventurous of you will write a program to modify a great deal of memory with a FOR-NEXT loop; fine!), let's move on to the display list and change it. Let's pick one of the 24 blocks, each using eight scan lines because they're in graphics 0. Let's change one of them to graphics 8.

What will happen? Well, Antic will display the contents of that memory (40 bytes) as graphics 8 dots. Since we are only using one, not eight scan lines, with a graphics 8 display block the length of the entire screen will shortened by seven scan lines. (Yes, you will be able to see it.) The letters on that line will disappear and we will get a collection of dots, in a horizontal line of that display block, which are the characters represented as dots. We won't throw Antic off any, in terms of keeping it on the right line (you'll recall we discussed this a while ago), for both graphics 8 and graphics 0 use 40 bytes per display block.

Pick a byte in the middle of the display list's graphics 0 instructions on your printout or screen. I picked 39984. It can be any one of the 2 graphics 0 display block instructions, by the way, but it shows up more if you pick one in the middle. The code for graphics 8 is 15, so to modify

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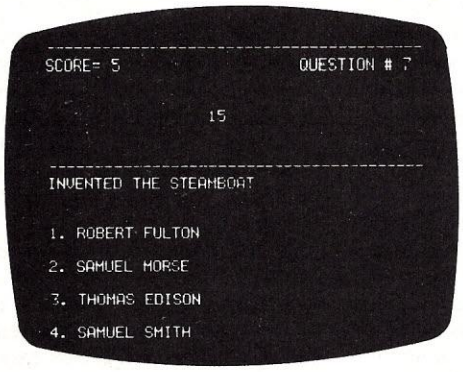

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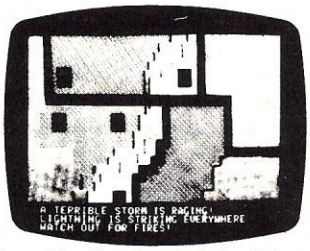
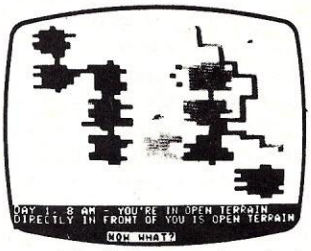


Forest Fire. Use chemical retardants and backfires to control raging forest fires.



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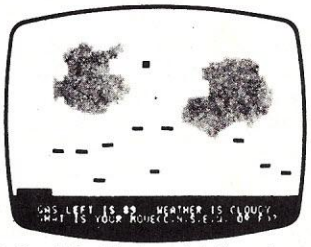

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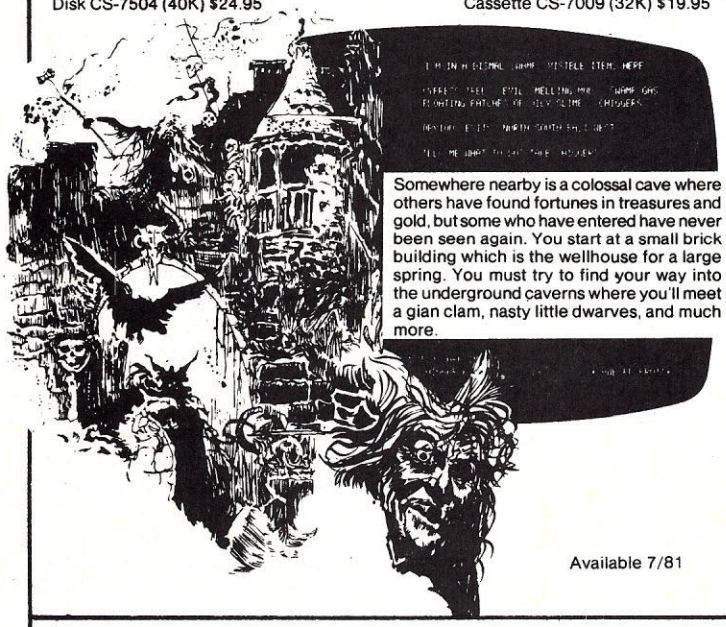

Somewhere nearby is a colossal cave where others have found fortunes in treasures and gold, but some who have entered have never been seen again. You start at a small brick building which is the wellhouse for a large spring. You must try to find your way into the underground caverns where you'll meet a gian clam, nasty little dwarves, and much more.

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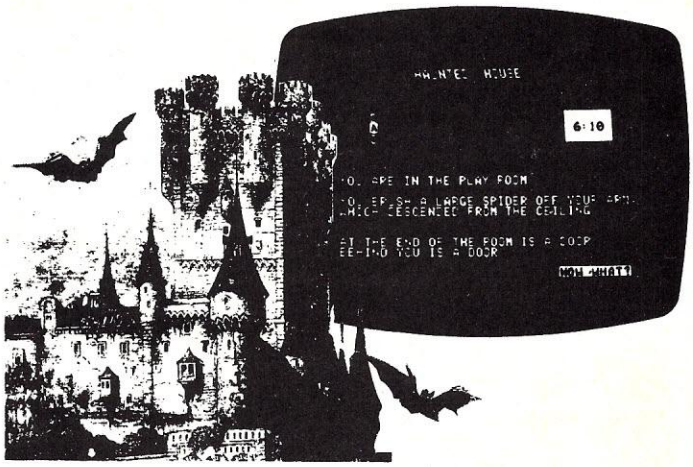

It's 6:00 pm and you have until midnight to find the secret passageway out of a large rambling HAUNTED HOUSE. During your search you'll encounter skeleton keys, charms, friendly ghosts, and evil spirits. Sound effects add to the eerieness. The layout changes in every game.

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byte 39984 from 2 to 15, we type: POKE 39984, 15 (return).

Now look at the middle of your screen! The line of characters that was on that line a second ago is gone. In its place is a very small line of dots—our graphics 8 display block. (By the way, if you had a blank screen when you typed that POKE, you won't see any dots. Why not? There are zeroes in display memory for a blank screen, and zeroes to graphics 8 mean no dots.) Now for something really wild, list something onscreen.

You will see the darndest "black hole" effect. A line of characters will scroll up, hit the character line which is now a graphics 8 line, and disappear. It will appear instead as a group of dots. When it scrolls up again, it will reappear, and something else will take its place. This is very consistent, remember. The data in display memory hasn't changed; only the way Antic interprets it has changed. That particular display block is now in graphics 8, that's all. If we wanted to restore it to graphics 0, how would we do it? Well, just POKE the 2 back in there: POKE 39984, 2 (return), and the line of graphics 8 dots will disappear, to be replaced by graphics 0 characters. (RESET also works).

What I have shown you so far can be loads of fun to experiment with. A program to change every 2 in the display list to a 15 is spectacular (i.e., FOR L = 39974 to 39995 in this example), and very easy to write. You can predict the result with a little thought: all the characters will turn into dots, and there will be 24 lines in graphics 8 at the top of the screen, with the rest blank where the characters used to be. If you change them to 15, then back to 2, you will get a neat yo-yo effect. These are just suggestions; feel free to experiment. If you do something really bad to the Atari, just press RESET and all will be restored to normal. (Try power off/on if that doesn't work, which is rare.)

Now let's find out about the rest of the graphics modes. "Hmmm," you say to yourself, "if graphics 0 is 2 in the display list, and graphics 8 is 15 what are 3, 4, 5, ..., 14?" Good question. They are the graphics modes 1-7, the other Atari modes. Now, for you in the back row with your hand waving wildly, yes, it's true. The Atari has nine Basic graphics modes, and the numbers 2-15 imply there are 14 graphics modes, not just nine. You are right. Atari just doesn't tell you about the other modes, so I'm telling you now. A complete list of graphics modes follows. It lists the DL code, Basic graphics number (if any), whether it's characters or graphics, how high a display block in it is, the number of colors, and X and Y points.

Some of the graphics modes available (and yes, these do work; POKE them into the display list and see) are just variations on graphics modes. The extra character modes are strange, however. Experiment with them! I will give you one piece of information. Mode 3, with an odd number of lines per display block, is used with a re-defined character set, as for super or subscripts, for use in matrix algebra. For those of you I've just lost, the Atari has the capability, which I'll cover in a future article, of having the shape table for its characters re-defined. In other words, that X could become a Z. Or, any collection of dots you would like in that dot matrix, like the letters of another language, for example. This graphics mode enables characters to be bumped up or down in the text line, allowing you superscripts or subscripts if you re-define the character set.

Let's try something else—just for fun. It may not be useful, but it is interesting. Instead of letting Antic show the normal display memory, let's let it show another part of memory. If we alter the address (16-bit) where we told Antic in the display list where display memory was, Antic will faithfully put whatever it finds there onscreen. Let's change it to show a place in memory that changes very rapidly all the time, which should make for an interesting and rapidly changing display. Type NEW for a new program, then

```
1 POKE 39972,1: POKE 39973,0
RUN (return)
```

This will set Antic to displaying memory starting at location #1. Antic will then be showing you the bottom of memory, which it now thinks is display memory. You will get a rapidly flickering display. Reset to get out of it. For those of you with different addresses, change that memory address to 1, then 0.

If you would like to see Antic become misaligned with display memory, as we discussed some time ago when mapping out display memory for custom displays, just change one of the display list instructions to one which uses less than 40 bytes per block. (Graphics 2 will do.) You'll see the effect onscreen.

A few hints on using custom display lists:

•Start with a Basic graphics display list longer than or equal to the length of the one you will need. It is very easy to shorten a display list and memory (which happens as a result of changing the DL). This way, all the needed space is automatically allocated by Basic and you will not need to worry about running into Basic's tables and such. To shorten the display list, just move the JVB instruction up.

•Don't try to POKE too much data. As you will soon find out, POKE is rather slow (usually it is accompanied by FOR-NEXT loops). Until you learn machine language, it is best to format your display memory using PRINTS or other Basic graphics commands as much as possible.

•Experiment! I think the Atari is the most superb graphics machine for the price you can find. You will find it has more capabilities than you can keep track of, and more things to play with and find out about than any other machine. You will likely do something no one has ever accomplished before if you start trying to achieve a given display on the machine, and to me that's an exciting thing to know while working on a computer. There is even more information coming about the Atari, for we have barely scratched the surface. For example, how would you like to be able to scroll the display vertically or horizontally? That's another capability of the list. And there are many more secrets waiting.

Finally, we have only covered one of the two available graphics systems in the Atari. Not only are there display list graphics, which outstrip other machines in flexibility, but there is something called Player-Missile Graphics—a totally independent graphics system, for producing spectacular animation. We'll cover that, as well as some added information on the display list in our next article.

Until then, Happy Hunting! □

Antic Code	Basic Gr. Mode	Char/Graphics	DB Lines	Colors	X	Y
2	0	Char	8	2	40	24
3	none	Char	10	2	40	odd
4	none	Char	8	4	40	24
5	none	Char	16	4	40	12
6	1	Char	8	5	40	12
7	2	Char	16	5	20	12
8	3	Graphic	8	4	40	24
9	4	Graphic	4	2	80	48
10	5	Graphic	4	4	80	48
11	6	Graphic	2	2	160	96
12	none	Graphic	1	2	160	192
13	7	Graphic	2	4	160	96
14	none	Graphic	1	4	160	192
15	8	Graphic	1	1	320	192

Table 3.

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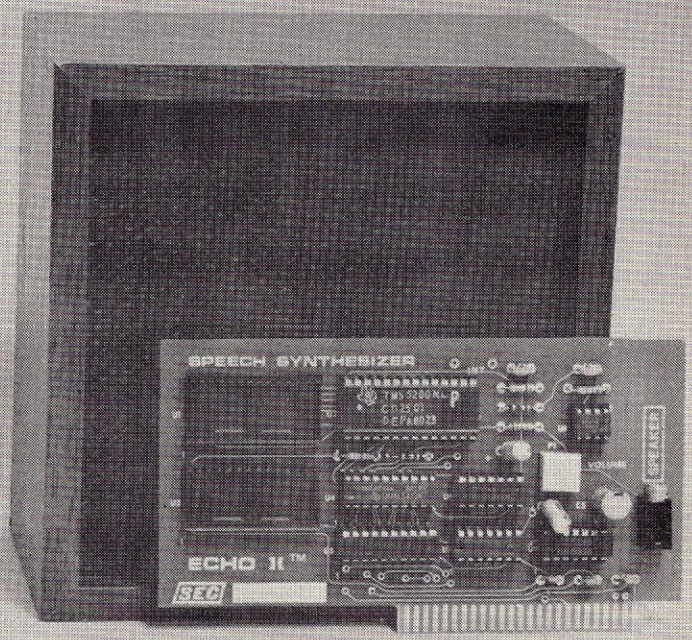

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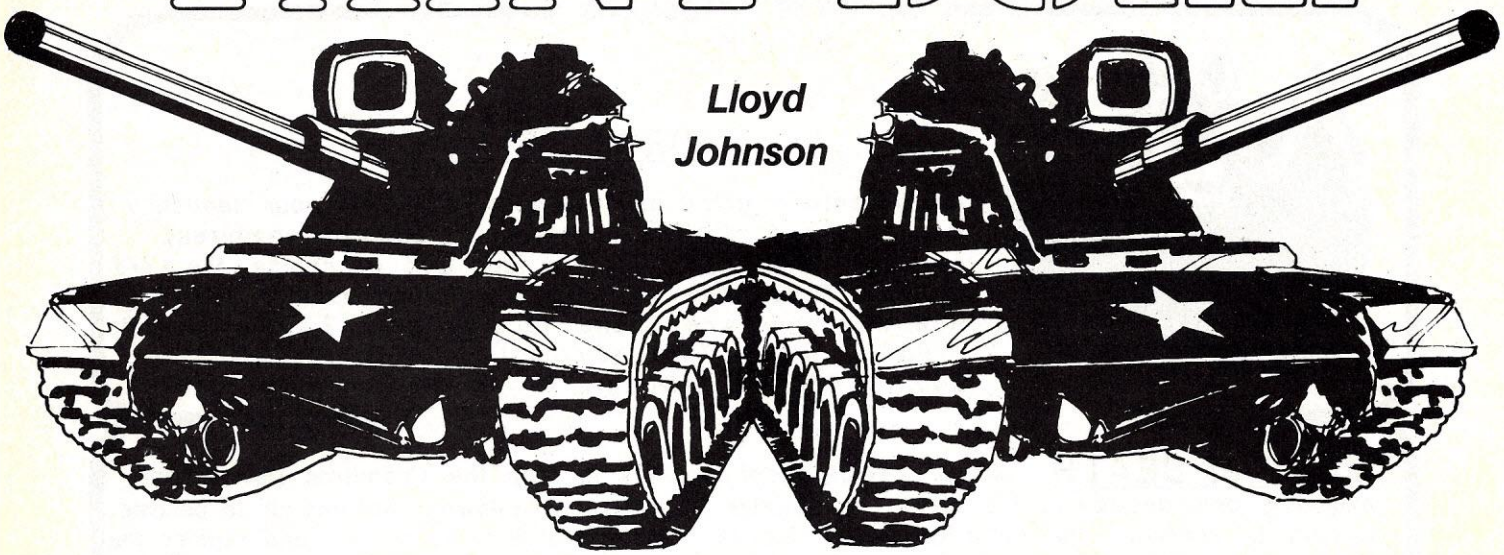
PAINT DUEL



Lloyd Johnson

Paint Duel is a one player tank battle simulation game written in H.P. Basic. With little or no modification this program should work on most machines. The game consists of both you (the human) and the computer moving a tank on a nine by nine board. Each tank can either move one square in any direction or launch a paint cannister at the opposing tank. Each turn consists of the human and the computer completing their turn simultaneously without knowledge of what the other is doing. This makes it possible for the two tanks to score simultaneous hits if each tank shoots at the square the opposing tank occupies. Neither tank is allowed to move into a square which has been covered with paint. More detailed instructions on how the game is played may be in lines 180-250 of the program.

Although there is a great amount of luck associated with the outcome of the game, strategy can also be employed to change the odds. For example; if you reveal your position to the computer by shooting when your tank is located alongside of the board, you could expect a 16.7% chance that the computer will cover you with paint if it shoots the next turn. The computer is able to determine that your tank will be located in any one of six squares on the following turn and will choose one of them for its shot. The odds of being hit on the following turn decrease to 11% if you are surrounded by 8 empty squares when you shoot. If you are in the corner when you shoot your chances of being hit on the following turn increase to 25% since your next position is then limited to four squares.

Most of the computer's strategy is contained in the decision to move or shoot. This decision is based on a variable, P, which represents the percent chance the computer will shoot rather than move. The factors affecting the value of P are listed as follows:

1. The number of squares eligible for the computer's next position, (N1).

2. The number of squares the human's tank may be occupying since he last revealed his position, (N2).

3. If the computer has shot on the preceding turn, (M1=1).

4. If the computer is angry, (A=20).

The computer simulates anger by setting the anger flag, A, equal to 20. There is a 25% chance this will happen whenever the human has fired more often than the computer. When the computer is angry, the anger flag A is added to the variable P, which increases the percent chance the computer will shoot rather than move. Once the computer has fired the same number of shots as the human there is a 25% chance its anger will calm, causing A to be restored back to 0.

If the computer decides to move rather than shoot, the square it will move into (including the square it is currently occupying) is chosen at random. I intentionally omitted giving the computer any specific movement strategy in order to avoid the possibility that the human player would be able to consistently predict its new position and easily win. Unfortunately this makes it possible for the human to trap the computer with some carefully placed shots, since the computer is incapable of figuring out how to avoid this situation. However, in order for this to happen the human will almost have to shoot constantly which risks making the computer angry. The human also reveals his position every time he shoots which makes the placement of any computer shots dangerously accurate.

Each tank can either move one square in any direction or launch a paint cannister at the opposing tank.

If the computer decides to shoot rather than move the square it shoots at is chosen at random from a set of squares the human may be occupying. This set of squares is determined by the human's position when it was last identified and by the last turn number the human fired a shot. If the human has fired on the preceding turn, there is a 35% chance that the computer will place his shot on the human's last known position. This is done to discourage the human from shooting on two consecutive turns.

The computer will never place a shot into a square already covered with paint since it is programmed to know the human tank could never be located there. The only possible way the computer would place a shot into its own position, is if the only possible position for the human's tank was in the same square. If this occurs the computer would cover both itself and the human with paint, which would cause the game to end in a tie.

Lloyd Johnson, 11847 Silhouette Place, Florissant, MO 63033.

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COUNTERS three modes of play are described below.

I— COUNTERS draws a number of identical geometric figures (either squares, triangles, or diamonds.) Each figure is accompanied by an identifying musical phrase. COUNTERS then asks "How many?", both visually and musically. The child counts the total and presses the number key. He receives a dramatic exploding star on the screen and a happy tune. There is a 10 point score for each correct answer, adding to 100 for a complete game.
Concepts: Number as quantifier. Number as enumerator of similar items.

II — **In this mode, COUNTERS draws a variety of different figures, and asks "How many?" The child again counts the total. An adult, (or an older child) can point out that the total number is made up of shapes of several different kinds. In later stages, MODE TWO is an endless source of elementary addition problems.**
Concepts: Counting by groups of similar objects. Concept of a "total". Basic process of addition.

III — **COUNTERS again draws a variety of figures, but asks the child to count only one kind. The player must discriminate accurately between shapes, a necessary precondition to reading.**
Concepts: Shape discrimination. Basic process of subtraction.

A unique feature of COUNTERS is that the entire game can played by sound alone, as each game-event is signaled by a musical phrase. With some practice, vision impaired children can successfully play all modes.

COUNTERS also incorporates a Teacher's Aide for adult use, which analyzes the child's game for accuracy. The game itself never penalizes the child for an inappropriate answer. The Manual contains a section HINTS ON TEACHING WITH COUNTERS, to assist parents and teachers in getting the most value from the game.

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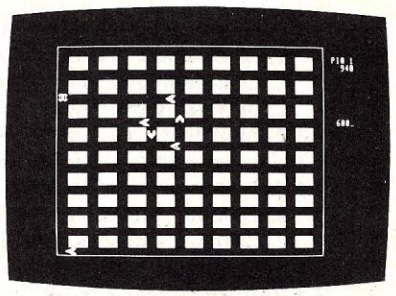

The latest of Quality Software's great arcade games for the Sorcerer is ARROWS AND ALLEYS, by Vic Tolomei. You drive your car in a maze of alleys. Your task is to eliminate a gang of arrows that constantly pursues you. You have a gun and the arrows don't, but the arrows are smart and they try to stay out of your sights and will often attack from the side or from behind. Eliminate the arrows and another, faster gang comes after you. Four levels of play. Requires 16K or more of RAM. **$17.95**

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CIRCLE 195 ON READER SERVICE CARD

Paint Duel, continued...

This program is arranged into three sections. The initialize section prints the instructions if requested, randomizes the random number function, and initializes the variables. The main logic section, which will be described in greater detail, is where the game is actually played. The end program section prints the results of the game and accepts a request for a rematch. An outline of the program is listed as follows:

1. Initialize section. Lines 70-840.
2. Main logic section. Lines 860-3240.
   - 2.1 Gather data and make move/shoot decision. Lines 1000-1510.
     - 2.1.1 Calculate N2. Lines 1080-1200.
     - 2.1.2 Calculate N1. Lines 1220-1330.
     - 2.1.3 Is computer angry or calm. Lines 1350-1420.
     - 2.1.4 Make move/shoot decision. Lines 1440-1510.
   - 2.2 Computer moves. Lines 1530-1640.
   - 2.3 Computer shoots. Lines 1660-1810.
   - 2.4 Accept human's command. Lines 1830-2520.
     - 2.4.1 Input human's move. Lines 2020-2290.
     - 2.4.2 Input Human's shot. Lines 2310-2520.
     - 2.4.3 Display landscape. Lines 2540-2770.
   - 2.5 Evaluate human's move or shot. Lines 2790-3000.
   - 2.6 Evaluate computer's move or shot. Lines 3020-3240.
3. End program section. Lines 3260-3440.

The main logic section consists of control statements and thirteen subroutines. The control statements are found in lines 880-980. These statements update the turn number, call five of the six level 1 subroutines, and transfer control to the end program section if either tank is covered with paint.

The subroutines have been arranged into two levels as depicted in the program outline. All level 1 subroutines (2.1, 2.2, 2.3, 2.4, 2.5, and 2.6) are called only from the control statements in the main logic section. Two of the level 1 subroutines (2.1 and 2.4) call a set of level 2 subroutines to perform tasks for them. These level 2 subroutines have been numbered to identify the level 1 subroutine which is calling it. For example; the level 2 subroutines 2.1.1, 2.1.2, 2.1.3, and 2.1.4 are all called from the level 1 subroutine 2.1.

This program was arranged in this structure to simplify any modifications or additions. One interesting modification would be to experiment with a computer movement strategy that would be difficult for the human to predict. Some modifications for machines with graphics capability would be to have the landscape continuously displayed and updated. It may also add excitement to have the computer's position on the landscape displayed by a blinking "C", whenever it shoots. I would appreciate receiving any letters about these or any other modifications that are made to this program. My address is listed in lines 30-50 of the program.

The following is a list of all the variable names and their descriptions for use in implementing and debugging this program:

Variable Name	Description
A$	Human's command entered from the keyboard. A$="M" executes the move command. A$="S" executes the shoot command. A$="D" executes the display landscape command.
B$	Board value printed during the display battlefield command. B$="." implies an empty or computer occupied square. B$="X" implies a painted square which cannot be entered. B$="H" implies a human occupied square.
A	Anger flag. A=0 implies the computer is calm. A=20 implies the computer is angry.
B(9,9)	Array representing the board. B(R,C)=0 implies an empty square. B(R,C)=1 implies the computer's tank occupies the square B(R,C)=2 implies the human's tank occupies the square B(R,C)=3 implies that both tanks occupy the square B(R,C)=4 implies the square is painted. R and C may be any variable representing the row and column respectively.
C1	Human tank's column position after he has shot. Initial value is 5.

The computer will never place a shot into a square already covered with paint.

C2	Computer's tank's present column position. Initial value is a random number from 1 to 9.
C3	Column position of the square the computer is shooting at.
C4	Human tank's present column position. Initial value is 5.
C5	Column position of the square the human is shooting at.
D1	Computer tank painted flag. Initial value is 0. Value is set to 1 when the computer's tank is painted.
D2	Human tank painted flag. Initial value is 0. Value is set to 1 when the human's tank is painted.
F1	Number of times the computer has shot. Initial value is 0.
F2	Number of times the human has shot. Initial value is 0.
I	Temporary variable.
J	Temporary variable.
M1	Move flag for the computer. M1=0 implies that the computer will move. M1=1 implies that the computer will shoot.
N	Number of turns since the human tank has shot.

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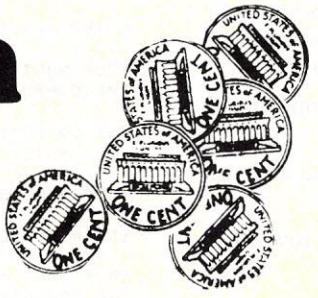

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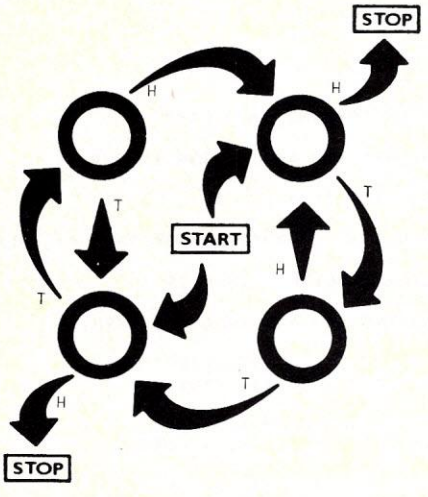

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CIRCLE 161 ON READER SERVICE CARD

Paint Duel, continued...

N1 The number of squares the computer can move into on the next turn. The square the computer is currently occupying is also counted.

N2 The number of squares the human's tank may be occupying since the last turn in which the computer has identified the human's position.

P The percent chance the computer will shoot instead of moving.

R1 Human tank's row position after he has shot. Initial value is 8.

R2 Computer rank's present row position. Initial value is 1.

R3 Row position of the square the computer is shooting at.

R4 Human tank's present row position. Initial value is 8.

R5 Row position of the square the human is shooting at.

R9 Repeat flag.
- R9=1 implies the command which was entered does not constitute a turn. This causes a request for another command.
- R9=0 implies the command which was entered constitutes a turn. Control is then transferred back to the control statements in the main logic section.

T1 Present turn number. Initial value is 0.

T2 Turn number indicating when the human tank has last shot. Initial value is 0.

X Argument for the RND function. Initial value is 0. This value may be modified to match the peculiarities of the machine.

X1 Dummy variable used in randomizing the random number function.

```
PAINT DUEL

DO YOU WANT INSTRUCTIONS (Y/N)?N
ENTER A RANDOM NUMBER BETWEEN 1 AND 500?5

TURN NUMBER= 1     ENTER COMMAND (M,S,D)?M

ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO?7,4

MOVE COMPLETED NEW POSITION IS 7     4

THE COMPUTER HAS FIRED A SHOT FROM 1     5
     WHICH HAS COVERED 8     5     WITH PAINT

TURN NUMBER= 2     ENTER COMMAND (M,S,D)?D
   1 2 3 4 5 6 7 8 9
 1 . . . . . . . . .
 2 . . . . . . . . .
 3 . . . . . . . . .
 4 . . . . . . . . .
 5 . . . . . . . . .
 6 . . . . . . . . .
 7 . . . H . . . . .
 8 . . . . X . . . .
 9 . . . . . . . . .

TURN NUMBER= 2     ENTER COMMAND (M,S,D)?M

ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO?6,3

MOVE COMPLETED NEW POSITION IS 6     3

NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 3     ENTER COMMAND (M,S,D)?S

ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT?3,5

YOUR SHOT WILL COVER 3     5     WITH PAINT
THE COMPUTER HAS IDENTIFIED YOUR POSITION

THE COMPUTER HAS FIRED A SHOT FROM 2     5
     WHICH HAS COVERED 7     2     WITH PAINT

TURN NUMBER= 4     ENTER COMMAND (M,S,D)?S

ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT?2,5

YOUR SHOT WILL COVER 2     5     WITH PAINT
THE COMPUTER HAS IDENTIFIED YOUR POSITION

NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 5     ENTER COMMAND (M,S,D)?D
   1 2 3 4 5 6 7 8 9
 1 . . . . . . . . .
 2 . . . . X . . . .
 3 . . . . X . . . .
 4 . . . . . . . . .
 5 . . . . . . . . .
 6 . . H . . . . . .
 7 . X . . . . . . .
 8 . . . . X . . . .
 9 . . . . . . . . .

TURN NUMBER= 5     ENTER COMMAND (M,S,D)?M

ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO?5,4

MOVE COMPLETED NEW POSITION IS 5     4

NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 6     ENTER COMMAND (M,S,D)?S

ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT?3,6

YOUR SHOT WILL COVER 3     6     WITH PAINT
THE COMPUTER HAS IDENTIFIED YOUR POSITION

THE COMPUTER HAS FIRED A SHOT FROM 2     7
     WHICH HAS COVERED 6     4     WITH PAINT

TURN NUMBER= 7     ENTER COMMAND (M,S,D)?D
   1 2 3 4 5 6 7 8 9
 1 . . . . . . . . .
 2 . . . . X . . . .
 3 . . . . X X . . .
 4 . . . . . . . . .
 5 . . . H . . . . .
 6 . . . X . . . . .
 7 . X . . . . . . .
 8 . . . . X . . . .
 9 . . . . . . . . .

TURN NUMBER= 7     ENTER COMMAND (M,S,D)?M

ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO?4,3

MOVE COMPLETED NEW POSITION IS 4     3

NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 8     ENTER COMMAND (M,S,D)?S

ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT?3,7

YOUR SHOT WILL COVER 3     7     WITH PAINT
THE COMPUTER HAS IDENTIFIED YOUR POSITION

THE COMPUTER HAS FIRED A SHOT FROM 3     8
     WHICH HAS COVERED 6     5     WITH PAINT

TURN NUMBER= 9     ENTER COMMAND (M,S,D)?S

ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT?3,8

YOUR SHOT WILL COVER 3     8     WITH PAINT
THE COMPUTER HAS IDENTIFIED YOUR POSITION
```

```
NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 10     ENTER COMMAND (M,S,D)?D
   1 2 3 4 5 6 7 8 9
 1 . . . . . . . . .
 2 . . . . X . . . .
 3 . . . . X X X X .
 4 . . H . . . . . .
 5 . . . . . . . . .
 6 . . . X X . . . .
 7 . X . . . . . . .
 8 . . . . X . . . .
 9 . . . . . . . . .

TURN NUMBER= 10     ENTER COMMAND (M,S,D)?M

ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO?4,2

MOVE COMPLETED NEW POSITION IS 4     2

NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 11     ENTER COMMAND (M,S,D)?S

ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT?3,9

YOUR SHOT WILL COVER 3     9     WITH PAINT
THE COMPUTER HAS IDENTIFIED YOUR POSITION

NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE

TURN NUMBER= 12     ENTER COMMAND (M,S,D)?M

ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO?5,2

MOVE COMPLETED NEW POSITION IS 5     2

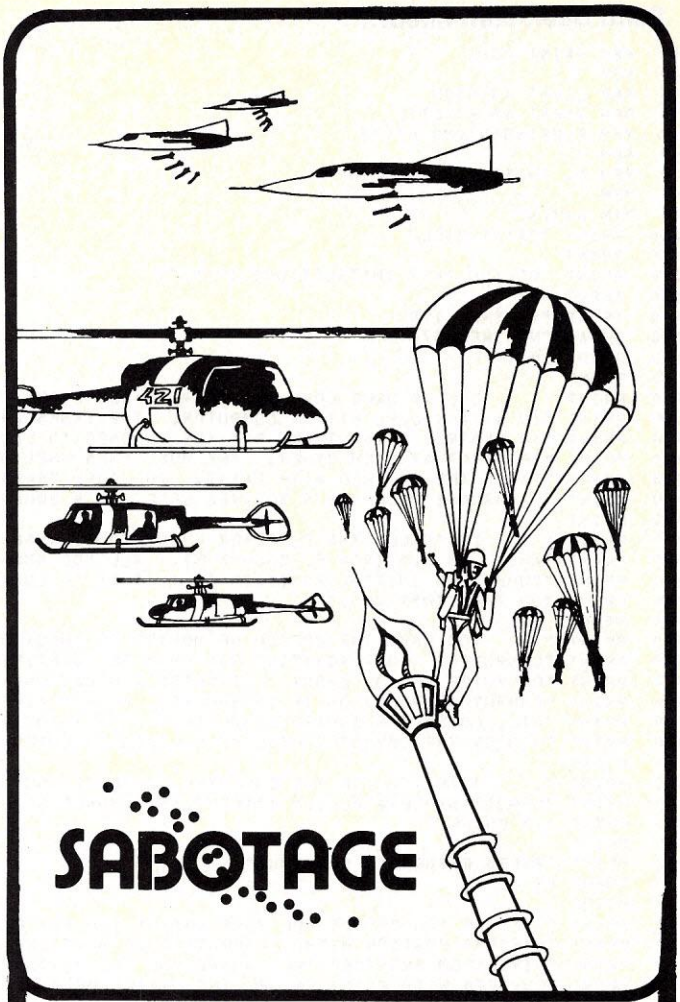
THE COMPUTER HAS FIRED A SHOT FROM 4     9
     WHICH HAS COVERED 5     2     WITH PAINT

THE COMPUTER HAS SPLATTERED YOUR TANK WITH PAINT

COMPUTER WINS --- HUMANS TANK COVERED WITH PAINT

DO YOU WANT TO TRY AGAIN (Y/N)?N
```

Program continued on page 192



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CIRCLE 196 ON READER SERVICE CARD

Paint Duel, continued...

```
10  REM PAINT DUEL
20  REM
30  REM LLOYD JOHNSON
40  REM 11847 SILHOUETTE
50  REM FLORISSANT,MO 63033
60  REM
70  REM 1. INITIALIZE SECTION
80  REM
90  DIM B[9,9]
100  PRINT "PAINT DUEL"
110  PRINT
120  PRINT "DO YOU WANT INSTRUCTIONS (Y/N)";
130  INPUT A$
140  IF A$="Y" THEN 170
150  IF A$="N" THEN 570
160  GOTO 110
170  PRINT
180  PRINT "     DUE TO SOME LONG AND COMPLICATED STORY, YOU ARE ENGAGED"
190  PRINT "IN A TANK DUEL WITH A COMPUTER.  THE TANKS ARE NOT ALLOWED"
200  PRINT "TO DESTROY EACH OTHER, BUT ARE ALLOWED TO LAUNCH CANNISTERS"
210  PRINT "OF PAINT AT EACH OTHER.  THE DUEL ENDS WHEN ONE OR BOTH"
220  PRINT "TANKS ARE COVERED WITH PAINT.  THE DUEL TAKES PLACE ON A"
230  PRINT "LANDSCAPE WHICH IS 9 SQUARES LONG AND 9 SQUARES WIDE."
240  PRINT
250  PRINT "     INITIALLY THE COMPUTER KNOWS YOUR PRESENT POSITION"
260  PRINT "WHICH IS 8,5 (ROW 8, COLUMN 5).  ALL YOU KNOW OF THE "
270  PRINT "COMPUTERS INITIAL POSITION IS THAT IT IS LOCATED SOMEWHERE"
280  PRINT "ON THE FIRST ROW."
290  PRINT
300  PRINT "     YOU HAVE THE OPTION OF MOVING OR SHOOTING AT THE "
310  PRINT "COMPUTER.  YOUR POSITION CAN ONLY BE IDENTIFIED BY THE "
320  PRINT "COMPUTER IF YOU SHOOT.  LIKEWISE YOU CAN ONLY IDENTIFY THE"
330  PRINT "COMPUTERS POSITION IF IT SHOOTS.  A SHOT FIRED INTO A SQUARE"
340  PRINT "WILL COVER THE SQUARE COMPLETELY WITH PAINT AND NEITHER"
350  PRINT "YOU OR THE COMPUTER WILL BE ALLOWED TO ENTER IT."
360  PRINT
370  PRINT "     BOTH YOU AND THE COMPUTER COMPLETE YOUR TURN (MOVE OR"
380  PRINT "SHOOT) SIMULTANEOUSLY WITHOUT ANY KNOWLEDGE OF WHAT THE OTHER
390  PRINT "IS DOING."
400  PRINT
410  PRINT "PRESS RETURN TO CONTINUE";
420  INPUT A$
430  PRINT
440  PRINT "     IF YOU CHOOSE THE MOVE OPTION YOU MAY EITHER HOLD YOUR"
450  PRINT "PRESENT POSTION WITHOUT SHOOTING OR MOVE ONE SQUARE IN ANY"
460  PRINT "DIRECTION PROVIDED THE SQUARE YOU ARE MOVING INTO IS NOT"
470  PRINT "COVERED WITH PAINT OR OFF THE LANDSCAPE."
480  PRINT
490  PRINT "     THE COMMANDS AVAILABLE TO YOU ARE AS FOLLOWS:"
500  PRINT
510  PRINT TAB(10);"COMMAND";TAB(30);"DESCRIPTION"
520  PRINT TAB(13);"M";TAB(30);"EXECUTE MOVE OPTION"
530  PRINT TAB(13);"S";TAB(30);"EXECUTE SHOOT OPTION"
540  PRINT TAB(13);"D";TAB(30);"DISPLAY LANDSCAPE"
550  PRINT
560  PRINT
570  LET X=0
580  PRINT "ENTER A RANDOM NUMBER BETWEEN 1 AND 500";
590  INPUT I
600    FOR J=1 TO I
610    LET X1=RND(X)
620    NEXT J
630    FOR I=1 TO 9
640      FOR J=1 TO 9
650      LET B[I,J]=0
660      NEXT J
670    NEXT I
680  LET R4=8
690  LET C4=5
700  LET B[R4,C4]=2
710  LET R1=8
720  LET C1=5
730  LET R2=1
740  LET C2=INT(9*RND(X))+1
750  LET B[R2,C2]=1
760  LET D1=0
770  LET D2=0
780  LET F1=0
790  LET F2=0
800  LET T1=0
810  LET T2=0
820  LET A=0
830  LET M1=0
840  LET R9=1
850  REM
860  REM 2. MAIN LOGIC SECTION
870  REM
880  LET T1=T1+1
890  GOSUB 1000
900  IF M1=1 THEN 930
910  GOSUB 1530
920  GOTO 940
930  GOSUB 1660
940  GOSUB 1830
950  GOSUB 2790
960  GOSUB 3020
970  IF (D1+D2)=0 THEN 880
980  GOTO 3260
990  REM
1000  REM 2.1 GATHER DATA AND MAKE MOVE SHOOT DECISION
1010  REM
1020  GOSUB 1080
1030  GOSUB 1220
1040  GOSUB 1340
1050  GOSUB 1440
1060  RETURN
1070  REM
1080  REM 2.1.1 CALCULATE N2
1090  REM
1100  LET N2=0
1110  LET N=T1-T2
1120    FOR I=-N TO N
1130    IF R1+I<1 OR R1+I>9 THEN 1190
1140      FOR J=-N TO N
1150      IF C1+J<1 OR C1+J>9 THEN 1180
1160      IF B[R1+I,C1+J]=4 THEN 1180
1170      LET N2=N2+1
1180      NEXT J
1190    NEXT I
1200  RETURN
1210  REM
1220  REM 2.1.2 CALCULATE N1
1230  REM
1240  LET N1=0
1250    FOR I=-1 TO 1
1260    IF R2+I<1 OR R2+I>9 THEN 1320
1270      FOR J=-1 TO 1
1280      IF C2+J<1 OR C2+J>9 THEN 1310
1290      IF B[R2+I,C2+J]=4 THEN 1310
1300      LET N1=N1+1
1310      NEXT J
1320    NEXT I
1330  RETURN
1340  REM
1350  REM 2.1.3 IS COMPUTER ANGRY OR CALM
1360  REM
1370  IF F1<F2 OR RND(X)>.25 THEN 1400
1380  LET A=0
1390  GOTO 1420
1400  IF F1>F2 OR RND(X)>.25 THEN 1420
1410  LET A=20
1420  RETURN
1430  REM
1440  REM 2.1.4 MAKE MOVE OR SHOOT DECISION
1450  REM
1460  LET P=50-M1*40-5*(9-N1)+2.5*(ABS(9-N2)+9-N2)+A
1470  IF RND(X)*100>P THEN 1500
1480  LET M1=1
1490  GOTO 1510
1500  LET M1=0
1510  RETURN
1520  REM
1530  REM 2.2 COMPUTER MOVES
1540  REM
1550  LET I=INT(RND(X)*3)-1
1560  IF R2+I<1 OR R2+I>9 THEN 1550
1570  LET J=INT(RND(X)*3)-1
1580  IF C2+J<1 OR C2+J>9 THEN 1570
1590  IF B[R2+I,C2+J]=4 THEN 1550
1600  LET B[R2,C2]=B[R2,C2]-1
1610  LET R2=R2+I
1620  LET C2=C2+J
1630  LET B[R2,C2]=B[R2,C2]+1
1640  RETURN
1650  REM
1660  REM 2.3 COMPUTER SHOOTS
1670  REM
1680  LET F1=F1+1
1690  IF RND(X)>.35 OR N>1 THEN 1730
1700  LET I=0
1710  LET J=0
1720  GOTO 1780
1730  LET I=INT(RND(X)*(2*N+1))-N
1740  IF R1+I<1 OR R1+I>9 THEN 1730
1750  LET J=INT(RND(X)*(2*N+1))-N
1760  IF C1+J<1 OR C1+J>9 THEN 1750
1770  IF B[R1+I,C1+J]=4 THEN 1730
1780  IF R1+I=R2 AND C1+J=C2 AND N2>1 THEN 1730
1790  LET R3=R1+I
1800  LET C3=C1+J
1810  RETURN
1820  REM
1830  REM 2.4 ACCEPT HUMANS COMMAND
1840  REM
```

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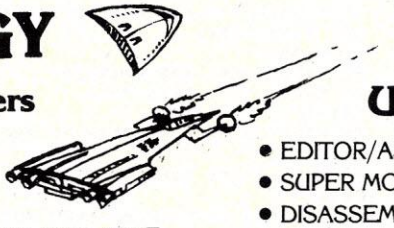

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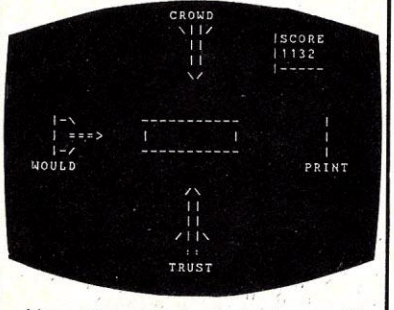

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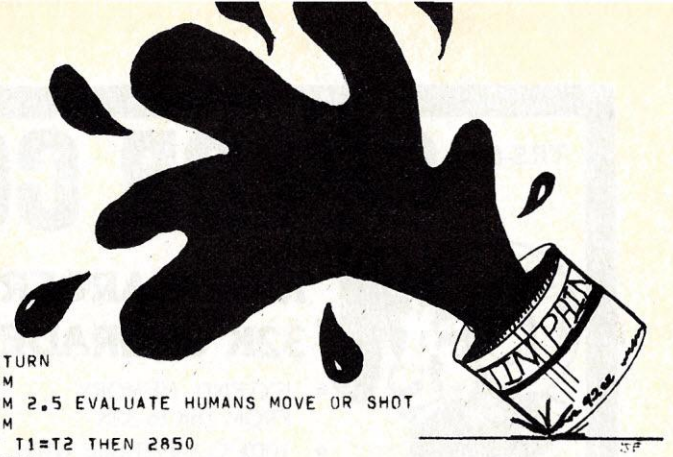

```
1850  PRINT
1860  PRINT "TURN NUMBER= ";T1;"ENTER COMMAND (M,S,D)";
1870  INPUT A$
1880  IF A$#"M" THEN 1910
1890  GOSUB 2020
1900  GOTO 1960
1910  IF A$#"S" THEN 1940
1920  GOSUB 2310
1930  GOTO 1960
1940  IF A$#"D" THEN 1980
1950  GOSUB 2540
1960  IF R9=0 THEN 2000
1970  GOTO 1850
1980  PRINT "INVALID COMMAND"
1990  GOTO 1850
2000  RETURN
2010  REM
2020  REM 2.4.1 INPUT HUMANS MOVE
2030  REM
2040  LET R9=1
2050  PRINT
2060  PRINT "ENTER ROW,COLUMN OF SQUARE YOU ARE MOVING INTO";
2070  INPUT I,J
2080  IF ABS(R4-I)<2 AND ABS(C4-J)<2 THEN 2120
2090  PRINT
2100  PRINT "YOU CAN ONLY MOVE ONE SQUARE"
2110  GOTO 2290
2120  IF I>0 AND I<10 AND J>0 AND J<10 THEN 2160
2130  PRINT
2140  PRINT "YOU ARE NOT ALLOWED TO LEAVE THE LANDSCAPE"
2150  GOTO 2290
2160  IF I=INT(I) AND J=INT(J) THEN 2200
2170  PRINT
2180  PRINT "INVALID COORDINATES"
2190  GOTO 2290
2200  IF B[I,J]<4 THEN 2240
2210  PRINT
2220  PRINT "MOVEMENT INTO SQUARES COVERED WITH PAINT IS NOT ALLOWED"
2230  GOTO 2290
2240  LET B[R4,C4]=B[R4,C4]-2
2250  LET R4=I
2260  LET C4=J
2270  LET B[R4,C4]=B[R4,C4]+2
2280  LET R9=0
2290  RETURN
2300  REM
2310  REM 2.4.2 INPUT HUMANS SHOT
2320  REM
2330  LET R9=1
2340  PRINT
2350  PRINT "ENTER ROW,COLUMN OF SQUARE YOU ARE SHOOTING AT";
2360  INPUT I,J
2370  IF I>0 AND I<10 AND J>0 AND J<10 THEN 2410
2380  PRINT
2390  PRINT "NO SHOTS ALLOWED OFF THE LANDSCAPE"
2400  GOTO 2520
2410  IF I=INT(I) AND J=INT(J) THEN 2450
2420  PRINT
2430  PRINT "INVALID COORDINATES"
2440  GOTO 2520
2450  LET R5=I
2460  LET C5=J
2470  LET T2=T1
2480  LET F2=F2+1
2490  LET R9=0
2500  LET R1=R4
2510  LET C1=C4
2520  RETURN
2530  REM
2540  REM 2.4.3 DISPLAY LANDSCAPE
2550  REM
2560  LET R9=1
2570  PRINT "  ";
2580    FOR I=1 TO 9
2590    PRINT  USING 2600;I
2600    IMAGE #,2D
2610    NEXT I
2620  PRINT
2630    FOR I=1 TO 9
2640    PRINT  USING 2600;I
2650      FOR J=1 TO 9
2660      IF B[I,J]>1 THEN 2690
2670      LET B$="."
2680      GOTO 2730
2690      IF B[I,J]#4 THEN 2720
2700      LET B$="X"
2710      GOTO 2730
2720      LET B$="H"
2730      PRINT " ";B$;
2740      NEXT J
2750    PRINT
2760    NEXT I
2770  RETURN
2780  REM
2790  REM 2.5 EVALUATE HUMANS MOVE OR SHOT
2800  REM
2810  IF T1=T2 THEN 2850
2820  PRINT
2830  PRINT "MOVE COMPLETED NEW POSITION IS ";R4;C4
2840  GOTO 3000
2850  PRINT
2860  PRINT "YOUR SHOT WILL COVER ";R5;C5;" WITH PAINT"
2870  PRINT "THE COMPUTER HAS IDENTIFIED YOUR POSITION"
2880  IF B[R5,C5]>0 AND B[R5,C5]<4 THEN 2910
2890  LET B[R5,C5]=4
2900  GOTO 3000
2910  REM SOMETHING WAS PAINTED
2920  IF B[R5,C5]=2 THEN 2960
2930  PRINT
2940  PRINT "YOU HAVE SPLATTERED THE COMPUTERS TANK WITH PAINT"
2950  LET D1=1
2960  IF B[R5,C5]=1 THEN 3000
2970  PRINT
2980  PRINT "YOU HAVE SPLATTERED YOUR OWN TANK WITH PAINT"
2990  LET D2=1
3000  RETURN
3010  REM
3020  REM 2.6 EVALUATE COMPUTERS MOVE OR SHOT
3030  REM
3040  IF M1=1 THEN 3090
3050  IF D1=1 THEN 3240
3060  PRINT
3070  PRINT "NO INFORMATION REGARDING THE COMPUTERS TANK IS AVAILABLE"
3080  GOTO 3240
3090  PRINT
3100  PRINT "THE COMPUTER HAS FIRED A SHOT FROM ";R2;C2
3110  PRINT "      WHICH HAS COVERED ";R3;C3;" WITH PAINT"
3120  IF B[R3,C3]>0 AND B[R3,C3]<4 THEN 3150
3130  LET B[R3,C3]=4
3140  GOTO 3240
3150  REM SOMETHING WAS PAINTED
3160  IF D2=1 THEN 3240
3170  LET D2=1
3180  PRINT
3190  PRINT "THE COMPUTER HAS SPLATTERED YOUR TANK WITH PAINT"
3200  IF B[R3,C3]=2 THEN 3240
3210  PRINT
3220  PRINT "THE COMPUTER HAS SPLATTERED HIS OWN TANK WITH PAINT"
3230  LET D1=1
3240  RETURN
3250  REM
3260  REM 3. END PROGRAM SECTION
3270  REM
3280  IF D1+D2<2 THEN 3320
3290  PRINT
3300  PRINT "TIE GAME --- BOTH TANKS COVERED WITH PAINT"
3310  GOTO 3380
3320  IF D1=0 THEN 3360
3330  PRINT
3340  PRINT "HUMAN WINS --- COMPUTERS TANK COVERED WITH PAINT"
3350  GOTO 3380
3360  PRINT
3370  PRINT "COMPUTER WINS --- HUMANS TANK COVERED WITH PAINT"
3380  PRINT
3390  PRINT "DO YOU WANT TO TRY AGAIN (Y/N)";
3400  INPUT A$
3410  IF A$="Y" THEN 630
3420  IF A$="N" THEN 3440
3430  GOTO 3380
3440  END
```

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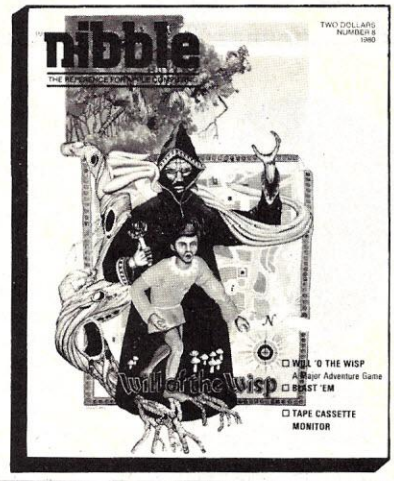

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puzzles & problems

Merlin's Summer Puzzle Contest

Last month Merlin announced the start of his Annual Summer Puzzle Contest. If you missed the rules here they are again:

1. There will be ten prizes for the ten best puzzles sent in.
2. There are no specific puzzle categories. You can send in coin puzzles, change-the-word puzzles, logic puzzles, word-doodles, math puzzles, picture puzzles. Just make them good puzzles.
3. All puzzle entries must be postmarked no later than July 31, 1981 to be eligible.
4. What are the great prizes that Merlin will bestow on the lucky ten? Each winner will get a set of five puzzle books comprised of; *Merlin's Puzzler, Merlin's Puzzler 2, Merlin's Puzzler 3, The Clue Club,* and, *Computer Coin Games.*

One last word. If your entry doesn't win one of the top ten prizes you still have a chance that Merlin may use it later on during the year. If this happens he will of course send you a copy of one of his great books.

So, join the fun and send in your best puzzles. Who knows, you may end up in Merlin's Hall of Puzzle Fame!

Compute This Tune

A simple computer music synthesizer plays only three notes — low (boom), middle (ping) and high (tweet). Arthur, a precocious child, has programmed the system as follows: (1) any two repeated notes are followed by a ping, (2) a high/low note pair is followed by a tweet and (3) a low/high note pair is followed by a boom. The system is now driving everyone crazy. Why?

Another Train Problem

The crack commuter special, from Anytown to New York City, left the station on time one morning and headed in towards the Big Apple. An hour out of the station the train developed engine trouble (does this sound familiar?) and had to proceed at three-fifths of its former speed. When the train finally limped into Grand Central Station it was two hours late. The conductor was heard to say that if the train had broken down fifty miles closer to New York the train would have only been one hour and twenty minutes late. Using the clues presented above can you determine how many miles Anytown is from New York City?

1 2 3	P T	1 2 3	P T	1 2 3	P T	1 2 3	P T	1 2 3	P T
3-4-5	1-2	3-0-5	3-2	2-1-5	3-2	1-2-5	3-2	0-3-5	3-2
3-4-4	1-3	3-0-4	3-1	2-1-4	3-1	1-2-4	3-1	0-3-4	3-1
3-4-3	2-4	3-0-3	3-1	2-1-3	1-1	1-2-3	2-1	0-3-3	3-1
3-4-2	2-3	3-0-2	1-1	2-1-2	2-1	1-2-2	1-1	0-3-2	2-1
3-4-1	2-2	3-0-1	1-3	2-1-1	1-1	1-2-1	2-1	0-3-1	2-3
3-4-0	2-1	3-0-0	1-2	2-1-0	1-2	1-2-0	2-2	0-3-0	2-2
3-3-5	3-5	2-4-5	1-1	2-0-5	3-3	1-1-5	3-4	0-2-5	3-3
3-3-4	3-4	2-4-4	1-2	2-0-4	3-2	1-1-4	3-3	0-2-4	3-2
3-3-3	3-3	2-4-3	2-3	2-0-3	3-1	1-1-3	3-2	0-2-3	3-1
3-3-2	3-2	2-4-2	2-4	2-0-2	3-1	1-1-2	3-1	0-2-2	3-1
3-3-1	3-1	2-4-1	2-1	2-0-1	1-2	1-1-1	3-1	0-2-1	2-2
3-3-0	2-1	2-4-0	2-2	2-0-0	1-1	1-1-0	2-1	0-2-0	2-1
3-2-5	3-4	2-3-5	3-4	1-4-5	2-1	1-0-5	3-5	0-1-5	3-5
3-2-4	3-3	2-3-4	3-3	1-4-4	1-1	1-0-4	3-4	0-1-4	3-4
3-2-3	2-2	2-3-3	3-2	1-4-3	2-2	1-0-3	3-3	0-1-3	3-3
3-2-2	1-3	2-3-2	3-1	1-4-2	2-1	1-0-2	3-2	0-1-2	3-2
3-2-1	2-1	2-3-1	1-1	1-4-1	2-3	1-0-1	3-1	0-1-1	3-1
3-2-0	1-1	2-3-0	2-1	1-4-0	2-4	1-0-0	lost	0-1-0	lost
3-1-5	3-3	2-2-5	3-5	1-3-5	3-3	0-4-5	3-1	0-0-5	3-4
3-1-4	3-2	2-2-4	3-4	1-3-4	3-2	0-4-4	3-1	0-0-4	3-3
3-1-3	3-1	2-2-3	3-2	1-3-3	1-1	0-4-3	2-1	0-0-3	3-2
3-1-2	3-1	2-2-2	3-2	1-3-2	3-1	0-4-2	2-2	0-0-2	3-1
3-1-1	1-2	2-2-1	3-1	1-3-1	2-2	0-4-1	2-4	0-0-1	lost
3-1-0	1-3	2-2-0	2-1	1-3-0	2-3	0-4-0	2-3		

The Return Of Big Mac

In the October 1979 issue of *Creative Computing* Merlin introduced you to Maskelyne and Cooke's Wonder Of The Age, the "Big Mac" computer, circa 1890. In that article you were taught how to program your computer to generate "magic number squares". Today Merlin brings back Big Mac for a repeat performance. Merlin challenges you to play the game of "Nim" with Big Mac. You begin by setting down three piles of coins on the table. Place 3 coins in pile 1, 4 coins in pile 2, and 5 coins in pile 3. Play alternates between the reader and Big Mac. During a player's turn he *must* remove at least one coin from one of the three piles. He can remove the whole pile or any part of the pile. The player can remove coins from only one pile at a time. The loser is the one who is *forced* to remove the last coin from the table. Now that you know the rules try a game with Big Mac. At the top of each column of moves in the chart pictured at left is the key "1 2 3 P T". The "1 2 3" stands for each one of the piles of coins. The "P" stands for the word PILE and the "T" stands for the word TAKE. Here's how we use this key: If you start the game by removing 2 coins from pile 3, the table setup would be 3 coins in pile 1, 4 coins in pile 2 and 3 coins in pile 3 (3-4-3). To find Big Mac's countermove look down the columns under 1 2 3 until you find (3-4-3). Then look to the right (under P T) and you find 2-4. This is the countermove and means "From PILE 2 TAKE 4 coins". Remove 4 coins from pile 2 and it's your turn again. If you wish Big Mac to go first remove 2 coins from pile 1. This is always his opening move.

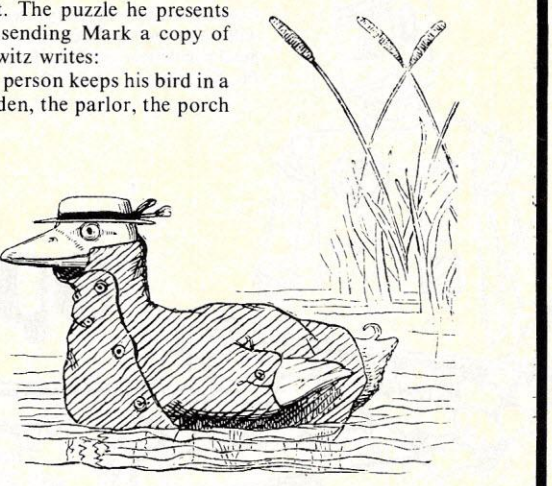
When you tire of playing Nim with Big Mac why not sit down and write a program to play it on your own computer? This is one of the first programs that your editor wrote many years ago, in the SPS language, for the IBM 1401 computer. Instead of 3, 4 and 5 coins why not try 7, 11 and 15 coins in the 3 piles. Also, why limit the game to 3 piles? Why not 4 or 5 piles? In our game with Big Mac I have given you all of the possible combinations and countermoves. In your program try to write a formula that will analyze each setup and generate the correct countermove.

For The Birds

Our next puzzle is from Mr. Mark Kantrowitz, of Brookline, MA. Mr. Kantrowitz has sent us several puzzles in the past. The puzzle he presents here should keep you busy for awhile. Merlin is sending Mark a copy of *Merlin's Puzzler 2* for his submission. Mr. Kantrowitz writes:

"Everybody in the Bird family owns a bird. Each person keeps his bird in a different part of the house, either the kitchen, the den, the parlor, the porch or the bedroom. The birds are a parrot, a canary, a mynah, a parakeet, and a cockatoo. In no particular order the names of the birds are Polly, Hamlet, Cleo, Mungo, and Beano. From the clues given try to determine each bird's name and the room in which it is kept as well as the member of the family who owns it. The members of the family are the grandfather, the husband, the wife, the son, and the daughter.

1. The daughter's bird is not a parakeet or a cockatoo or a mynah, and none of these birds just mentioned is named Polly or Beano.
2. The grandfather's bird is not kept in the parlor or the kitchen.
3. The son's bird is not kept in the parlor or the kitchen.
4. The names of three types of birds begins with the same letters as the name given to them by their owners.
5. The husband's bird is not the one kept in the kitchen, is not a canary, and is not named Cleo.
6. The bird in the kitchen is not named Cleo and is not a canary.
7. The wife's bird Beano is not kept in the kitchen or the den.
8. The canary is not kept in the parlor or a bedroom.
9. The son's parrot is not kept in a bedroom.



Dan The Duffer

Dashing Dan the Duffer has become the most talked about player at the Merlin Silver Springs Country Club. It seems that after years of scooping divots out of the fairways and slicing golf balls over and through the club house, Dan has finally gotten his game together. The strange thing about it is that no matter what wood or iron he hits the golf ball with, it travels only one of two distances. Dan has worked it out so that by combining these two shots, sometimes hitting two long shots and one short shot as an example, he can play the front nine of our course in twenty-six strokes. Now Dan always plays in a straight line from tee to cup, his hooks and slices being a thing of the past. Also, he sometimes will hit the ball past the green and have to hit back to the green to hole out. It makes no difference to him, he is always able to sink the ball by hitting it one of two distances. Our problem is to try and calculate what the two distances are that Dan uses in hitting his way to fame and fortune. The yardage for the first nine holes on our course is 150 yards, 300 yards, 250 yards, 325 yards, 275 yards, 350 yards, 225 yards, 400 yards, and 425 yards. (This puzzle is from the book *Merlin's Puzzler 2* by Charles Barry Townsend and published by Hammond, Inc.)

A Ship Wreck Puzzle

Our last puzzle is from the pen of that great Victorian puzzler, Professor Hoffmann. "Several years ago a ship with a crew of 15 seamen and 15 passengers ran into trouble. A storm arising, it became necessary to take to the boats, but these only afforded room for half the number. It was agreed that all should stand in a circle, and that the captain should count round and round the circle by tens, each tenth man to take his place in the boats till the number of fifteen was reached, the others to take their chance with the ship.

The captain, desiring to favour himself and his crew, so placed the men that the fifteen passengers were all left behind.

How must the captain arrange everyone in the circle to effect this result?"

Answers on page 226.

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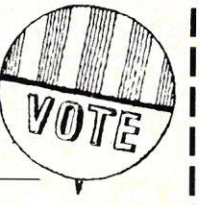

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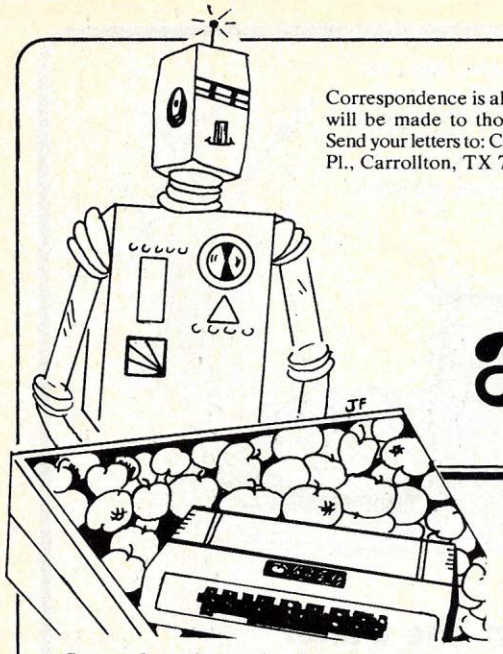

Correspondence is always welcome and a response will be made to those accompanied by a SASE. Send your letters to: Chuck Carpenter, 2228 Montclair Pl., Carrollton, TX 75006

apple cart

Chuck Carpenter

Some of you know that I work for Xerox. We're getting ready to announce a new product. I can't say much about it now, but those of us in manufacturing here are really excited about this product. But that's enough of that for now.

Several of you readers responded to the Pilot offer I made; more than I expected. About ten percent of you wanted DOS 3.3. Several others wanted special customization. It was not practical for me to do either. The task of duplication and packaging alone was overwhelming. Each disk was duplicated on a 48K system using DOS 3.2.1. They are not masters. There were four copies of the program included. Also on the disk were two text files. There are programs included in the original column (Feb. '81). I hope you're having fun with your mini-Pilot. I've certainly enjoyed it.

Voice recognition was featured at our computer club recently. The unit demonstrated was by Scott Instruments. You can see ads featuring this device in recent computer magazines. One ad appeared in the April '81 Complete Computer Catalog in *Creative Computing*. I had a chance to use this equipment, and it is fantastic. It can be used to do things like run Basic programs or control external devices. I was able to condition its input recognition to accept my voice only. We also conditioned the instrument to recognize either of the two voices. One use of a unit such as this is control of equipment without the use of hands. One example involved a lady who is a quadraplegic; with the Scott VET/2 Voice Entry Unit, and the Mountain Computer BSR Remote Controller, this lady could control her bed, the lights, and many things around her, as well as summon help. Now, this is a *real* micro computer application. The unit is more expensive than those you may have seen so far. But, it really works. The cost is $895. Scott Instruments, 815 North Elm, Denton, TX 76201. (817) 387-9514.

Graphics Book

Those of you interested in hi-res graphics will like this book. It's called *Computer Graphics Primer*, and it's by Mitchell Waite. The book has been on the market for a couple of years but I just "discovered" it. Chapters 1 and 2 are general information about graphics and graphics history. The rest of the book is about graphics programs, all of which were written on the Apple II. You learn how to use the graphics commands and how to make things seem to move on the screen. The programs work too. This book is one of the Sams Primer series. Mitchell Waite has written several of them; all well done. It's Sams publication number 21650, and the cost of the copy I have was $12.95.

OOPS!

A program to simulate the LINE INPUT command from other versions of Basic was included in the April '81 issue (page 204, GET vs INPUT). As written, the program doesn't work. Craig Peterson wrote and explained why: "The PEEK function in line 10040 will gather the input with the high bit of each character set (*to one—CC*). Applesoft strings want this bit to be zero. Therefore, all the characters will look normal on the television (*or monitor—CC*) screen, but they will be wrongly represented internally. The resulting problem is that any Applesoft compares will be impossible to satisfy. The STOP used to stop the program doesn't work because 'STOP' in line 25 has the high bits off while A$ has them all set. The problem can be corrected by changing line 10040 to:

10040 A$=A$+CHR$(PEEK(J+511)-128)"

As Craig pointed out, had I run this program I would have noticed the problem. Since I had a listing with a sample run (???), I took a shortcut. Sigh!

Z-80 TELLS TIME

It's not immediately obvious, but the Mountain Computer clock board will work with the Microsoft Z-80 board. At least it does with a Microsoft Basic program I wrote. Some detective work was required first. The reason for this is that the Z-80 maps memory differently.

- Address 0000H for the Z-80 system is $1000 in the 6502 system. Notice that Z-80 convention uses the trailing H to indicate Hex. 6502 convention uses the $ to indicate Hex.
- High memory, from E000H to FFFFH, starts at 6502 address $0000. This is the same as page 0 through page 7 of the standard Apple.
- Some way was needed to find where things were in memory.
- Apple CALL commands are included in Microsoft Basic to call 6502 commands once you find out where they are.

Where Am I?

First, I needed to find out what was going on in memory. A dump routine is included with the CP/M operating system,

```
100 HOME
110 INPUT"STARTING ADDRESS - ",X
120 INPUT"RANGE IN BYTES - ",Y
130 PRINT: PRINT"ADDR.";
140 PRINT"   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15"
150 PRINT"-----";
160 PRINT"-------------------------------------------------------------------------------"
170 GOSUB 250
180 FOR I=X TO X+Y-1
190 A$=HEX$(PEEK(I))
200 IF LEN(A$)=1 THEN A$="0"+A$
210 PRINT A$;"  ";
220 N=N+1 : IF N=16 THEN PRINT :  N=0 : X=X+16 : GOSUB 250
230 NEXT I
240 END
250 PRINT USING "$$$$$  ";X;
260 RETURN
```

Listing 1. Microsoft MBasic listing of memory dump program used to create the dump shown in Figures 1 and 2. Note the HEX$ and PRINT USING commands that are not available in Applesoft.

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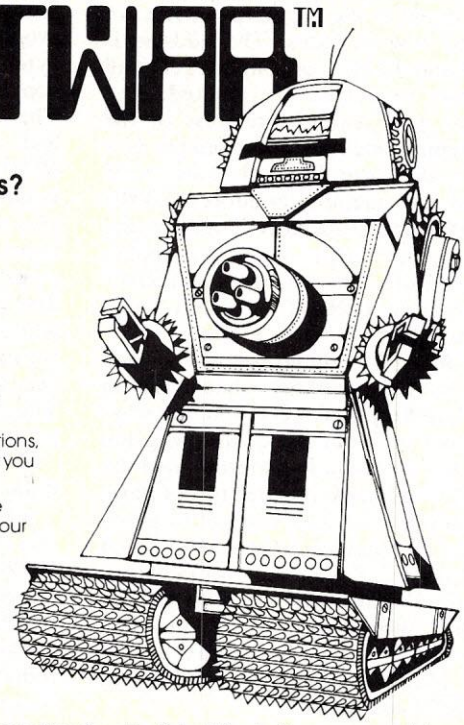

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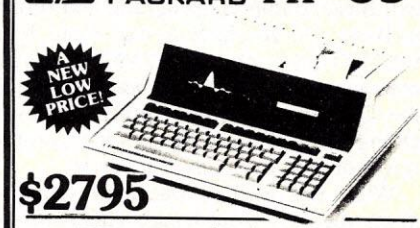

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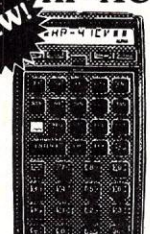

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Apple Cart, continued...

ADDR.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
62208	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
62224	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
62240	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
62256	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
62272	00	00	00	00	00	00	00	00	00	00	3A	BB	F3	FE	03	C2
62288	0C	DB	3A	BE	E0	1F	9F	C9	CD	12	DB	E6	7F	C9	3A	BB
62304	F3	FE	03	C2	3E	DC	3A	BE	E0	E6	02	28	F9	79	32	45
62320	F0	21	7C	03	22	D0	F3	2A	DE	F3	77	C9	8D	BF	C0	60
62336	4A	F3	58	F3	12	DB	5E	F3	3E	DC	45	DD	45	DD	3F	DD
62352	3F	DD	EE	F2	2B	DD	20	1B	AA	D9	D4	A9	A8	1E	BD	0B
62368	0C	A0	00	0C	0B	1D	0E	0F	19	1E	1F	1C	0B	5B	00	7F
62384	02	5C	15	09	FF	FF	FF	FF	02	05	03	04	01	04	02	00
62400	AD	83	C0	AD	83	C0	8D	00	C7	AD	81	C0	20	3F	FF	20
62416	AA	C9	8D	81	C0	20	4A	FF	4C	C0	03	00	00	20	00	E7
62432	14	0B	00	CD	01	01	60	60	00	08	00	01	00	00	00	00
62448	C0	03	C0	03	A6	4C	C0	03	4C	C0	03	4C	C0	03	C0	03
62464																

Figure 1. Memory dump of page 3 of Apple memory. Address 62208 is Z-80 Address F300H. The equivalent 6502 address is $0300 or 768 decimal. Note the change in the vector addresses under control of the Z-80 starting at address 62448.

but, this is a slow procedure. You have to exit Basic, dump the program, and return to Basic. Or, you have to exit Basic, load the DDT program from CP/M and dump the range of memory you want, then exit the DDT program and return to Basic. Doing some of these things wipes out the range of memory you want to see.

What was needed was a program to dump memory from Basic. This is where some of the added power of MBasic comes in handy. There are a couple of commands that make the task much easier. The program in Listing 1 is an example of my results. The program uses decimal values to identify the memory locations. Further improvements of the program would do conversions for you. Other options would be to have the program do a disassembly of memory too. But that's another story.

Back to the dump routine. Lines 110 and 120 accept input for the starting address and the number of bytes to dump. Use the decimal equivalent of the starting address. You can use any number of bytes, but multiples of 16 up to 256 fit nicely on the screen. If you use only 40 columns, make it multiples of 8 up to 128 bytes per dump. Headers for the dump are provided by lines 130 to 160. Line 170 jumps to the address printing subroutine at line 250. This routine uses the PRINT USING command to format the address at the beginning of each row. A loop for printing the dump over the selected range starts at line 180. Line 190 converts the decimal value found by the PEEK to a hexadecimal number. The HEX$ command from MBasic is used to do this. In line 200, the program tests the length of the number. If the number is only one digit, a zero is appended to the front. In line 210, the hex number is printed along with a pair of spaces.

Line 220 does the rest of the work in the program. First it increments the address by one. Then it tests to see if 16 addresses have been printed. If not, control passes to the NEXT I on the next line. If 16 bytes have been printed, then a print is issued to disconnect the semicolon at the end of line 210. Remember that a semicolon causes print statements to print things next to each other on the same line. Next in line 220, N is set back to zero and X is incremented by 16 bytes. The variable X is now equal to the beginning address of the next row of bytes. The address is printed and the routine continues until all the bytes requested are printed. The program ends with the address of the next memory location. An example of a dump is shown in Figure 1. This is 256 bytes of Z-80 memory at address F300H or $0300 of 6502 memory. Some of you will recognize this as page 3 of Apple's memory. Note that I changed the PRINT commands to LPRINT so that I could direct the dump to my printer.

Use of this hex dump routine allowed me to examine memory while I was in Basic. Since my goal was to find out what was going on from Basic, this program solved my problem. It also simplified the task. Now there was no need to exit Basic each time there was a need to examine changes. Eventually, I figured out that part of page 3 (Figure 1) never changed. No matter what else I did with various programs, those first 74 bytes remained zeros. Now, I was ready to find a way to use my Mountain Computer clock board (MCCB) from MBasic.

Running The Clock

There is a command in MBasic that is used to call 6502 routines. It is CALL %. I experimented with POKEs and the use of the CALL % command until I found the proper combination. First, the clock needed to be activated. Then a way was needed to retrieve the data generated by the clock. Some background on what the clock does will be helpful at this point.

To use the MCCB with machine language, you need to do the following:

- Load the keyboard switch high byte (KSWH at address $27) with the clock address high byte. I have my clock in slot 4 so this byte is C4.
- Jump to the starting address of the clock routine at $C400.
- Return from the program and translate the data stored by the MCCB.

I have a machine language program that does this, so I used the first 8 bytes. The program looks like this:

```
LDA  #$C4
STA   $27
JSR   $C400
RTS
```

Using the values assembled from this program, I POKEd them into the first 8 bytes of page 3. Then I used the CALL % command to attempt to run the clock. The output of the MCCB is stored at the high end of the keyboard buffer from $0281 to $0294 (F281H to F294H in Z-80 notation). By using my dump routine, this area of memory was checked. Sure enough, there was the output from the clock. The clock output is stored in reverse order. The month and day start at the highest address. One thousandth of a second is stored at the lowest address. All of this is described in detail in the MCCB manual. The program in Listing 2 was the result of my experiments. Here's how it works.

Using the Clock

After converting the hex data from the sort assembly program, the POKEs in lines 60000 and 60010 resulted. These lines insert the code in page 3 as shown in Figure 2, which is a dump of the first 16 bytes of memory showing our 8 byte clock calling routine. The next 2 lines, 60020 and 60030 set-up the CALL % to the 6502 routine

```
60000 POKE 62208!,169 : POKE 62209!,196 : POKE 62210!,133 : POKE 62211!,57
60010 POKE 62212!,32 : POKE 62213!,0 : POKE 62214!,196 : POKE 62215!,96
60020 CLOCK = &H300
60030 HOME : CALL % CLOCK
60040 VTAB(10) :
60045 POKE 62088!,58 : POKE 62091!,58
60050 FOR I=62100! TO 62081! STEP -1
60060 A$=CHR$(PEEK(I))
60070 PRINT A$;
60080 NEXT I
60090 VTAB (22) : PRINT
60100 FOR I=1 TO 1000 : NEXT I
60120 GOTO 60030
```

Listing 2. MBasic clock calling program. Program POKEs machine language then CALLs it with a special MBasic command.

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Apple Cart, continued...

ADDR.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
62208	A9	C4	85	39	20	00	C4	60	00	00	00	00	00	00	00	00
62224																

Figure 2. First 16 bytes of page 3 after using the clock program in Listing 2.

from MBasic. I used the illustration in the MBasic manual to do this. Note that the H indicating hex precedes the address. Just the opposite from the way it is done at Z-80 addresses. That is, you use the offset with Z-80 0000H at 6502 $1000. When you call a 6502 address with the CALL % command you use the actual 6502 address. Makes the job more challenging this way.

Line 60045 inserts colons in the output from the clock. Normally, these two locations contain semi-colons. This keeps the clock data from confusing Applesoft programs. Colons look better in a time printout so I used them. A loop to print the output starts at line 60050. Remember that the clock data is stored in reverse order. Hence, the reverse stepping of the loop. The data in each memory location is converted to it's decimal ASCII value in line 60070 and printed in line 60080. The cursor is moved out of the way by line 60090 and a delay is created by line 60100. (A value of 256 in this loop changes the display very close to once a second.) Line 60120 keeps the display going as long as you want. If the routine was to be used with a program, the GOTO 60030 would be changed to a RETURN from a subroutine call.

Thus ended my quest to make my MCCB work with the Z-80 board. Now that wasn't all that difficult, was it?

FROM OUT OF THE PAST

Jack Cowley asked a question. Why all the fuss about protecting the Apple from accidental RESET? Well, once upon a time, the Apple keyboard was different than it is now. In the early days of yesteryear there was no autostart ROM. More importantly, there was no neat little switch on the back of the keyboard with which to select the CONTROL RESET option. On the older units—the first 75,000 or so—when the reset button was pushed that was it. You might be able to recover your program if you were lucky. The Autostart ROM helped some when it came along after about a year and a half. You could then recover the program easily, but whatever was happening at the time of a reset was probably lost. Some of the routines you may have seen, direct the reset vector to a safe place. Such a routine was submitted by Douglas Dougherty and was included in the April '81 column.

Check which unit you have before ordering accessories for use with the keyboard. Most of the lower case units are designed to work with one or the other, but not both. I have the Keyboard Enhancer from Videoterm now. It is designed to provide the CONTROL RESET option on level 6 or earlier machines. If your unit has the switch on the back of the keyboard you would use the level 7 model. I'll be telling you more about the Keyboard Enhancer in a future column.

NEXT TIME

The next column will feature more input from readers, including a description of how to obtain the mini-assembler on machines that don't have Integer Basic. and how to get the mini-assembler on machines that don't have Integer Basic, Also, I'll tell how to get the mini-assembler on machines that don't have the language system. □

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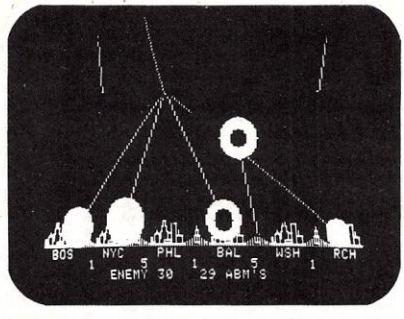

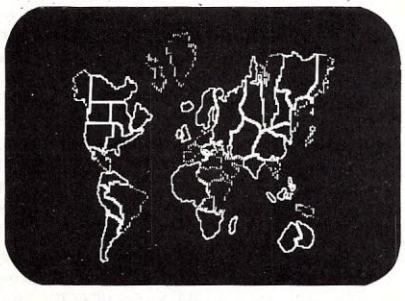

GLOBAL WAR by alan boyd

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Requires 16K Apple II or Apple II Plus

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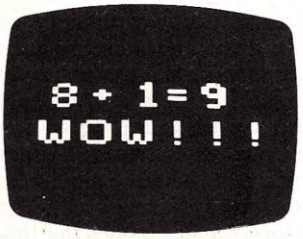
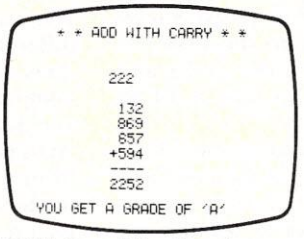
Spelling. Study aid with your list of troublesome words.



Math Drill. Arithmetic drill and practice with large or small display.



Add With Carry. Drill and practice on sums requiring numbers to be carried.

Ecology Simulations - I

Disk CS-4706, $24.95

Requires 48K Applesoft in ROM or Apple II Plus

Sterl

STERL allows you to investigate the effectiveness of two different methods of pest control—the use of pesticides and the release of sterile males into a screw-worm fly population. The concept of a more environmentally sound approach versus traditional chemical methods is introduced. In addition, STERL demonstrates the effectiveness of an integrated approach over either alternative by itself.

Pop

The POP series of models examines three different methods of population projection, including exponential, S-shaped or logistical, and logistical with low density effects. At the same time the programs introduce the concept of successive refinement of a model, since each POP model adds more details than the previous one.

Tag

TAG simulates the tagging and recovery method that is used by scientists to estimate animal populations. You attempt to estimate the bass population in a warm-water, bass-bluegill farm pond. Tagged fish are released in the pond and samples are recovered at timed intervals. By presenting a detailed simulation of real sampling by "tagging and recovery," TAG helps you to understand this process.

Buffalo

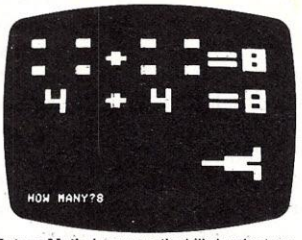
BUFFALO simulates the yearly cycle of buffalo population growth and decline, and allows you to investigate the effects of different heard management policies. Simulations such as BUFFALO allow you to explore "what if" questions and experiment with approaches that might be disatrous in real life.

CAI Programs Vol II

Cassette CS-4202 $11.95

Requires 16K Apple II or Apple II Plus

European Map. Identify countries and their capitals.



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Ecology Simulations - II

Disk CS-4707 $24.95

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Pollute

POLLUTE focuses on one part of the water pollution problem; the accumulation of certain waste materials in waterways and their effect on dissolved oxygen levels in the water. You can use the computer to investigate the effects of different variables such as the body of water, temperature, and the rate of dumping waste material. Various types of primary and secondary waste treatment, as well as the impact of scientific and economic decisions can be examined.

Rats

In RATS, you play the role of a Health Department official devising an effective, pratical plan to control rats. The plan may combine the use of sanitation and slow kill and quick kill poisons to eliminate a rat population. It is also possible to change the initial population size, growth rate, and whether the simulation will take place in an apartment building or an eintire city.

Malaria

With MALARIA, you are a Health Official trying to control a malaria epidemic while taking into account financial considerations in setting up a program. The budgeted use of field hospitals, drugs for the ill, three types of pesticides, and preventative medication, must be properly combined for an effective control program.

Diet

DIET is designed to explore the effect of four basic substances, protein, lipids, calories and carbohydrates, on your diet. You enter a list of the types and amounts of food eaten in a typical day, as well as your age, weight, sex, health and a physical activity factor. DIET is particularly valuable in indicating how a diet can be changed to raise or lower body weights and provide proper nutrition.

CAI Programs I and II

Disk CS-4701, $24.95
Requires 32K Integer Basic

This disk contains all 7 programs from cassettes CS-4201 and CS-4202.

Note: The ecology simulations programs are not available on cassette.

Stock & Options Analysis

Disk CS-4801, $99.95
Requires 32K Applesoft or Apple II Plus

This is a comprehensive set of four programs for the investment strategy of hedging listed options against common stocks. A complete description is in the TRS-80 section. Available August 1981.

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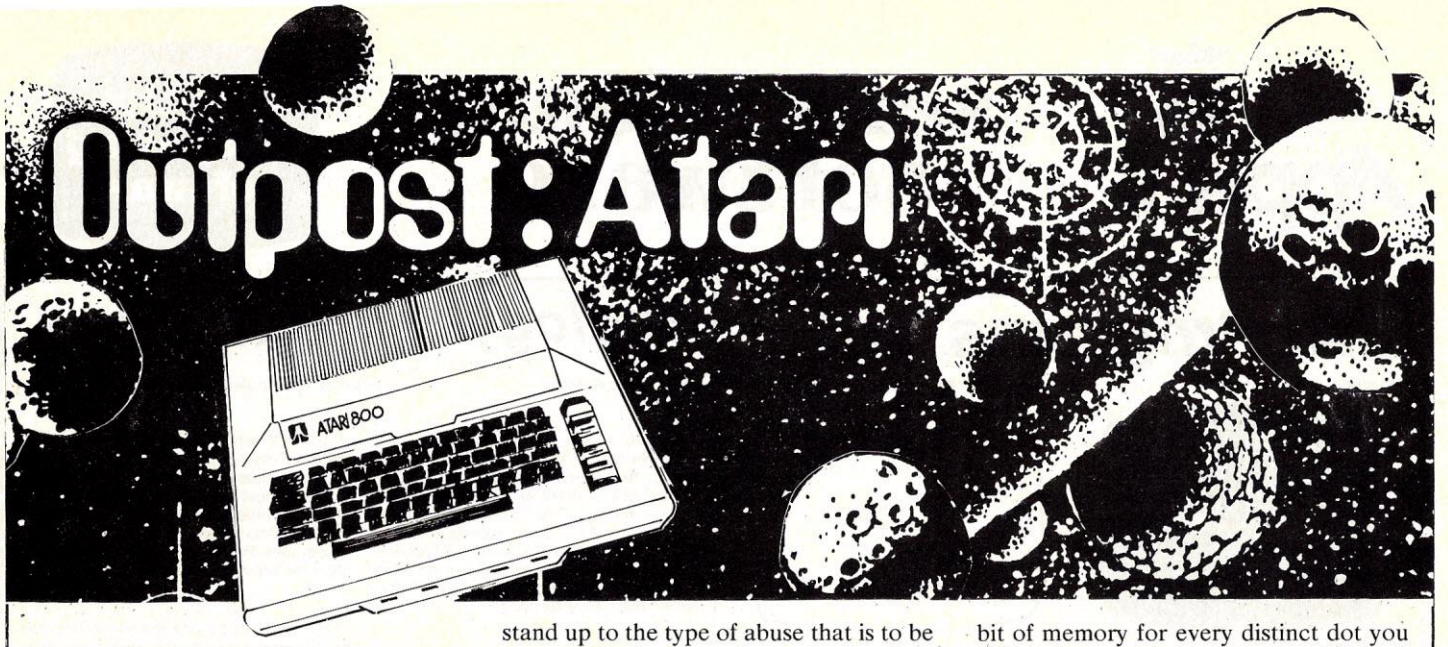

George Blank

View from the Outpost

This month, with newlyweds David and Sandy Small handling the technical information in part two of their article on the Antic chip, I'd like to give an overall view of the special abilities of the Atari Computers.

After taking over as Editorial Director of Creative Computing in December, I spent three months commuting from New Hampshire before I could buy a house and move to New Jersey. During that period, I sought guest writers for Outpost Atari. May's guest columnist was Dr. Mike Dunn, the editor of the Atari Computer Enthusiasts Newsletter, 3662 Maple Dr., Eugene, OR 97405 ($8 a year). June's guest columnist was Paul Hoffman, director of the Boston Atari Club, 48 Norfolk St., Cambridge, MA 02139.

What Makes the Atari Computers Special?

Very few programmers have learned to take advantage of the special features of the Atari. It will not be until programmers learn to combine several of these techniques into a single program that the Atari will really be appreciated. These special features are very important if you are programming the Atari, as programs that do not use them will have a hard time competing with those that do. We currently have articles planned on all of them.

Designed for the Home

The Atari is designed for use in the home by consumers, not just technical wizards. This shows in many ways. The RESET key is located away from the rest of the keys, and is protected by a plastic shield to prevent hitting it accidentally. Special function keys, START, SELECT, and OPTION, are provided separately from the rest of the keyboard for ease of use by the consumer.

All parts of the Atari are designed to stand up to the type of abuse that is to be expected in the home. For example, when Atari designed the joystick, they fully expected my 7 year old son to swing it by the cord and bang it into the floor, so they put strain reliefs on the cables and built it strong enough to take a lot of abuse.

Atari also realized that consumers don't like keyboards; the paddles, joysticks, and light pen were designed into the system. One of the easiest ways to tell that an Atari programmer knows what he or she is doing is to find that the keyboard is completely disabled early in the program, with all input from the other devices. This is the reason the Atari 400 has such a limited keyboard. Programs written for consumers probably shouldn't use the keyboard at all.

High Speed

Atari knew that it would take a fast computer to provide the capabilities the consumer needed. One of the reasons the Atari is more expensive than many of their competitors is that Atari specified costly, high speed parts. Their microprocessor chip runs 80% faster than a standard 6502. This means every other part has to be of high enough quality to keep up. In addition, they added the Antic chip, a custom designed microprocessor to handle the most time consuming task, processing the video display.

Programming Features

The real competence of the Atari is in some special features designed into the machine for the use of advanced programmers. These features are very powerful, and for that reason they demand a lot of programming skill to use. However, they can give a lot of polish and professionalism to a program.

Multiple Graphics Modes

Every color graphics display in a computer with limited memory requires a compromise. You essentially need one bit of memory for every distinct dot you wish to draw on the screen, plus additional bits to specify the color of each dot. If you want very high resolution and many different colors, you must have a tremendous amount of memory just to tell the computer what to display. This leaves very little memory for your program. The Atari has several different display formats, from a double wide, double height text mode that requires very little memory, to high resolution graphics modes that take a lot of memory. This selection allows the programmer to use only the amount of memory needed for display purposes.

Player/Missile Graphics

This powerful feature allows the programmer to efficiently establish and maneuver up to five players or four players and four missiles on the screen. These players and missiles can use separate colors, be different widths and heights, and can even take priority over each other so that when two of them are at the same location on the screen, the one "in front" conceals the other. Players and missiles are independent of other parts of the display, so that you can have text or graphics on the screen and have your player pass right over them. Or, by changing the priority register, you can have the player pass "behind" other objects and displays.

Collision Registers

With player missile graphics, there is a series of registers that tell whenever a player makes contact with another player, another missile, or an object drawn on the playfield. This makes it possible to check elaborate interactions between objects without having to write a routine that compares the location of each object with the location of each of the other objects.

Redefinable Character Sets

There is no particular reason why the table of shapes stored in the computer has to be a set of upper and lower case

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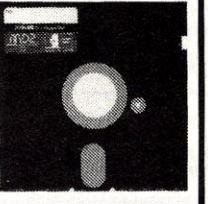

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Atari, continued...

letters, numbers, punctuation marks, and symbols. Why not have a set of 100 different spaceships? With the Atari, you can have both, plus a table of over 100 different interstellar objects and several other tables as well. You can switch from one character set to another instantaneously and print a space ship on the screen as simply as you print the letter "a".

Fine Scrolling

Due to the design of a television set, which calls for the picture to be drawn in a series of horizontal lines across the screen, it is much easier for a computer to provide smooth horizontal motion than smooth vertical motion. Some of the best video games, including Space Invaders, have been designed around this limitation, calling for most action and movement to take place in the horizontal plane, and allowing sudden jerky motion in the vertical plane. Atari has carefully built into their computers some tricks to enable programmers to have smooth vertical motion as well, though it takes a lot more work and skill than horizontal motion.

Display List Interrupts

Really fancy tricks with video displays require the ability to synchronize precisely the microprocessor and the video display. It is very tricky, but this built in capability of the Atari allows you to do such things as change the color registers two thirds of the way down the screen, always at exactly the same point. This involves alternating between color schemes 120 times a second and timing each change to within a hundred-thousandth of a second.

Indirect Color Registers

It looks complicated in the Atari to set a given color register to a particular color, and then specify the color register instead of the color when you are programming. But this complex procedure provides a great deal of power. It allows you to change instantaneously the color of an object just by changing the content of the register, and avoids redrawing the object. By switching colors between a foreground color and the background color, you can even make objects appear and disappear.

Built-in Sound Generators

Sound, like color, is a major advantage in most programs. However, it can be difficult to use sound in a program if you have to use the microprocessor chip to produce the sound, for a single chip can only do one thing at a time. With four built-in voices in the Atari, the central processor needs only to specify the characteristics of one of the voices and turn it on. It then goes to other tasks until it is time to turn the sound off. No microprocessor time is required to maintain the sound.

Expansion and Change

The Atari is designed for easy expansion and change. The address lines in the computer are designed to handle 192K of memory, using three 64K memory cards in an Atari 800. The 64K cards would presumably be based on the next generation of 64K RAM chips, which are too expensive at the moment, but the computer is already designed to use them. This would require a different operating system ROM, but changing the ROM is as simple as adding a memory card is now. Already there are products like Ramcram from Axlon that offer 32K byte memory cards instead of 16K. Axlon also offers a 256K memory expansion interface. (Axlon, 170 Wolfe Rd., Sunnyvale, CA 94086)

Atari's ROM cartridges also make it easy to change languages. Unlike the TRS-80 or the PET, which require ROM to be dedicated to Basic even when you are not using it, it is normal in the Atari to unplug Basic and plug in the Assembler cartridge or something else.

Summary of Special Features

It may be some time before we routinely see programs that combine non-keyboard input, extensive use of multiple colors, (I have seen 18 colors used effectively on the screen at one time, and 256 colors in a color pattern) player missile and character graphics, fine scrolling, and multiple character sets. One game which uses all of these techniques is currently under development at Atari, and I expect it to have an overwhelming impact on future computer games.

Atari has not been reluctant to share the techniques. For serious program developers, they have a support staff and offer seminars. This service is only available for persons with demonstrated commercial potential, usually software houses advertising Atari software. For amateur (but skilled) programmers, they make available their operating system reference manual for $30. Use this address: Operating System Manual, 1346 Bordeaux Ave., Sunnyvale, CA 94082. They are actively cooperating with magazines, user groups, and others trying to interpret the mystery of their machine to the general public. They are also working on future manuals and documentation, as well as software tools, to aid programmers. These software tools include several more programming languages, including an advanced Atari Basic, a Microsoft Basic, Forth, and Pascal.

16K Atari 400 now $399!

At the National Computer Conference in Chicago on May 5th, Atari announced that the 8K Atari 400 was being discontinued and that the price on the 16K version was being reduced to $399. This move seems to be in response to the new Commodore VIC-20, announced at $299, but with only 5K of memory. □

"Stop singing in that monotone!!!"

Popular Computing

Chas Andres

Are you ready to tackle the biggest adventure of them all? Enter the world of Z-80 assembly language! Explore the innards of your TRS-80 with these Z-80 tools from MISOSYS. Each program works on both Model I or Model III machines.

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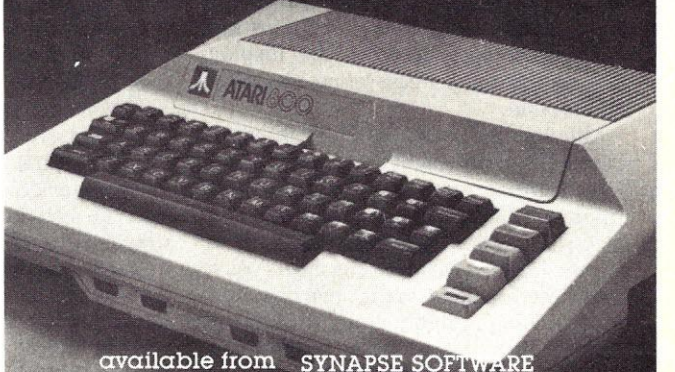

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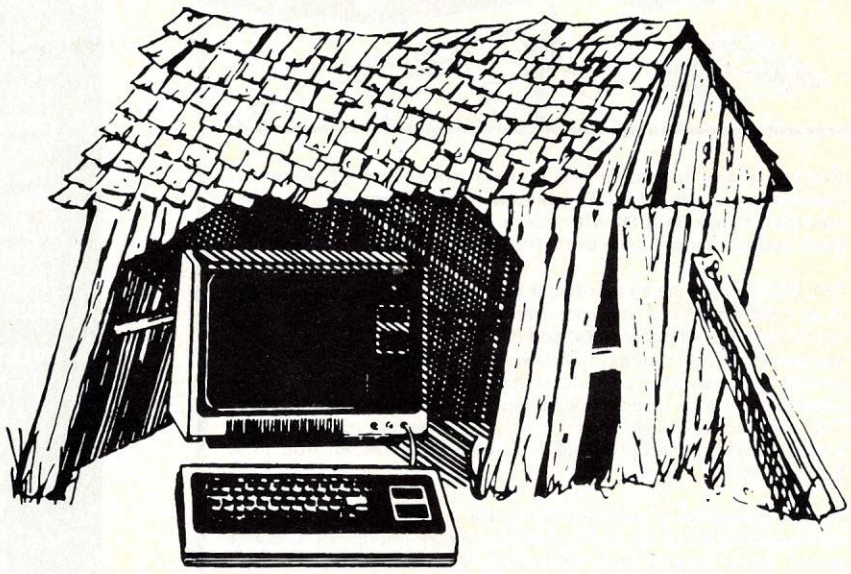

Stephen B. Gray

Only two items in column 31: a closer look at the TRS-80 Color Computer, and a short program that creates some fine graphics.

TRS-80 Color Computer

Radio Shack's TRS-80 Color Computer is an interesting combination of a machine with "instant-load Program Paks" designed to compete with color computers such as the Apple and Atari, and a machine that can be expanded to provide more programming capability than the Model I, Level II computer, both in graphics and in other functions.

If you're familiar with Level II Basic, you may find the vocabulary of the TRS-80 Color Basic that comes with the $399 4K model a little odd. Some curious tradeoffs were made in deciding what features to put into, and to leave out of, the internal Color Basic ROM used in the 4K model.

For instance, although the use of SHIFT 0 will cause the Color Computer to print out in lower case, the screen, instead of displaying the same lower-case letters that are printed out, reverses the display, showing green upper-case letters on a black background.

Although the use of SHIFT/right-arrow displays a right bracket you have to use SHIFT/*down*-arrow to display a *left* bracket. That's because left-arrow is backspace, and SHIFT/left-arrow is "erase current line." No real problem, unless you're really into brackets, but it's just one more thing to keep in mind, along with having to remember that to display a left-arrow, you have to press SHIFT/up-arrow.

Although 4K Color Basic has no SQR or EXP function, it calculates to nine digits instead of six, so that 10/7 on the Color Computer comes out as 1.42857143, and the Level II computer provides 1.42857.

Because the keys of the Color Computer are quite cheap, using the keyboard is like typing on a child's $9.95 typewriter. But there are no reported problems with keybounce.

The first 17 Level II error messages are also in the Color Computer, along with FD. In the Color Computer, there's no RM (no RESUME), RW (RESUME without ERROR), UE (unprintable error), MO (missing operand), or L3 (disk Basic Only).

However, there is AO (attempt to open a data file which is already open), DN (device-number error), DS (direct statement, in files), RM (bad file mode), IE (input past end of file), IO (input/output error), and NO (file not open). Somebody's done a lot of thinking about files.

The Color Computer prints in black (on the screen) over a green background; you can't print over any of the other eight colors: black, yellow, blue, red, buff, cyan, magenta or orange. And if you use SHIFT 0 to reverse the printing, that will affect only letters, which print green on black; numbers and anything else but letters still print black on green. That can make for some odd-looking displays.

NEW doesn't clear the screen, as it does in Level II Basic.

The character generator in the Color Computer contains 63 standard alphanumeric characters, 32 green-on-black reversed characters, and eight sets (one for each color) of 16 graphics characters. These 16 are all the possible combinations of four graphics blocks. Thus

```
100 PRINT CHR$(171);
110 PRINT CHR$(251)
```

will print first a blue L-shape followed by an orange L-shape.

4K Color Computer Manual

The 4K Color Computer manual, *Getting Started with Color Basic*, seems to have been written for children, which is better for the average user if it had been written for grownups, because just about anybody over the age of ten or thereabouts can understand just about everthing in the book. With a couple of exceptions, about which more later.

One nice thing about the 4K manual is that it's highly interactive: you're constantly asked if you can figure out what's happening, if you can change a program to make it do something different, or if you can write a program, for example, "to show a color you ask for," after which the manual shows a program that will do it, for you to compare your program with. The manual also provides space for writing your program.

The 4K manual begins to get a little complicated on page 88, where PEEK is used to make the button on the joystick do something. Although the explanation tells what happens, it doesn't explain why, because *that* gets even more complicated.

Yet, by page 114, the manual, which, except for that PEEK item has just been skimming over the surface of Basic, gets into string manipulation, using LEFT$, RIGHT$, MID$, LEN$ and VAL. These are all explained quite well, but are bound to be difficult for those who can't quite grasp the idea of just what a string is, to begin with.

Perhaps for the benefit of those who would find string manipulation somewhat difficult, the 4K manual makes no mention whatever of quite a list of statements and functions available in 4K Color Basic, including CONT, DIM, LLIST, ON/GOSUB, ON/GOTO, PRINT TAB, STOP, ABS, CHR$, POINT, SGN, SIN, USR and half a dozen more.

A complete listing is to be found on the *Color Basic Quick Reference Guide* packed with the computer, a folded card that lists

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$3440.00

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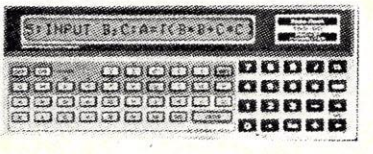

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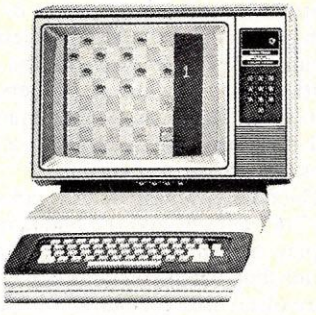

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41 Basic statements, 20 functions, 25 error messages, 6 special characters, 15 operators, 6 control keys, 3 video control codes, and the seven steps for starting up.

Color and Clarity

There's one thing that may tend to limit the use of the Color Computer to color graphics: letters, numbers and other characters aren't anywhere near as sharply defined as on the Models I, II and III, and the color screen holds less than half as many characters as the other three screens.

Although the color and black-and-white characters are both a quarter of an inch high, the color characters seem taller, because they're as wide as the double-width black-and-white characters.

In fact, the two look very much alike, and both are displayed 32 to a line, 16 lines per screen.

The differences are that the color display is 8 7/8" x 7 3/8" and the black-and-white display measures 7 1/2" x 6 5/8". This means that, when you compare the much-more-often-used *regular*-width black-and-white characters with the color characters, you get 64 x 16, or 1,024 characters in an area of 49.6875 square inches, or 20.61 characters per square inch, as against 512 color characters in an area of 65.45 square inches, or 7.82 characters per square inch. That's 2.63 times as many black-and-white characters per square inch as color characters.

This big difference is little or no problem if the Color Computer is to be used mainly by children, or mainly for graphics, or by people who've never seen how many more characters a black-and-white TRS-80 screen will hold.

But for people who do know the difference, and who want to put as much as possible on the screen, which is important when writing long programs, the preference will lie heavily in the direction of the Models I, II and III.

There's another problem: clearness of characters. The black-and-white characters use a 5 x 7 dot matrix, which is easier to read on the TRS-80 screen than printed dot-matrix characters, because the dots on the screen are elongated bits of brightened raster lines, which help fill in areas of screen characters that aren't filled in when printing. This makes for more sharply defined characters on the black-and-white screens.

The color characters use what seems to be a 7 x 7 matrix. The 13" diagonal television set sold by Radio Shack for use with the Color Computer is one of the XL series made by RCA. It uses the Super AccuLine picture tube, with the tree guns in a horizontal line rather than in the previous delta configuration, which put the three basic-color guns in a triangle.

The tube uses striped phosphors in the three basic colors; three vertical dashed lines, repeated over and over across the surface of the tube, and which light up in different combinations to provide the eight colors.

Because the lines of dashes are staggered, rather than all lined up in straight horizontal rows, horizontal lines are not straight, as they are on the black-and-white screen, but are instead somewhat fuzzy. Get close up to a color character, and you no longer see it at all; you have to stand back at least six inches before the characters are recognizable. Up close they blend right into the overall pattern of colored dashes.

Add to this the fact that the characters aren't really *black* on a colored background: the three color stripes don't turn off completely within characters, but show a little blue and a little yellow.

All of this goes to confirm my belief that the Color Computer is best suited to graphics, to programmers who want to try out a TRS-80 based on the Motorola 6809E microprocessor, and to writers who can produce books and articles more technical and wide-ranging than the two Color Computer manuals now available from Radio Shack.

Figure 1.

Program Paks

To make the Color Computer instantly usable, and thus competitive with other computers that use plug-in ROM packages, Radio Shack provides a ROM slot at the right rear side of the keyboard plus, at this writing, nine EPROM Programs Paks that cost $29.95 or $39.95. If you want instant operation, you've got to pay extra for it.

Music Pak

The Music Program displays the bass and treble clefs as soon as it's inserted and the computer turned on. With this $29.95 ROM plug-in, you can write two-voice music over a five-octave range, with sharps and flats.

The method of entering the notes may be unique among all the music-writing systems used with personal computers. You run a note up and down the staff, using the up-arrow and down-arrow keys, until the note is right where you want it. Then you press 2 for a half-note, or 4 for a quarter-note, etc. Or the right-arrow for a rest. After you've entered the note, you press the "/" key, which switches control to the lower note, which you then run up and down the staff like the top note. Or you can write the entire melody with top notes first, then add the bottom notes later.

Although it takes a while to select notes by running a note up and down the scale, this method is the simplest and easiest for those with no knowledge of music. As you run the note up and down, the displayed name of the note changes, to help the non-musical even more. At any time, you can play back what you've written so far.

With the Music Pak, you can repeat a phrase, write alternate endings for repeated phrases, transpose to different keys, write dotted notes, and change the tempo.

Diagnostic ROM Pak

The $29.95 Diagnostic ROM automatically tests memory and functions. After testing the computer's ROM and expansion ROM, the program tests the RAM memory with either a quick check that fills each byte with a number and then checks its presence, or with a long "worst-case" check. A video test checks the different graphics codes. The RS-232 test requires a shorting connector at the RS-232 port. The remaining tests check out the sound, cassette operation, keyboard, joystick, and printer.

This is a ROM to buy if you're going to use the Color Computer for any serious work, such as writing programs to sell. Run the diagnostics before each work session, to make sure the computer is OK before you start.

The 40-pin edge connector inside the ROM slot, which the Program Paks plug into, will probably be used as an expansion connector for future hardware.

Tape Recorder

Although no cassette tapes for the Color Computer are advertised in the RSC-5 catalog, they've been offered by other vendors for some months now. And while the catalog recommends the CTR-80A, you can use any similar recorder, such as the CTR-41. The only problem is in connecting it to the computer. The CTR-80A comes with a special cable that has

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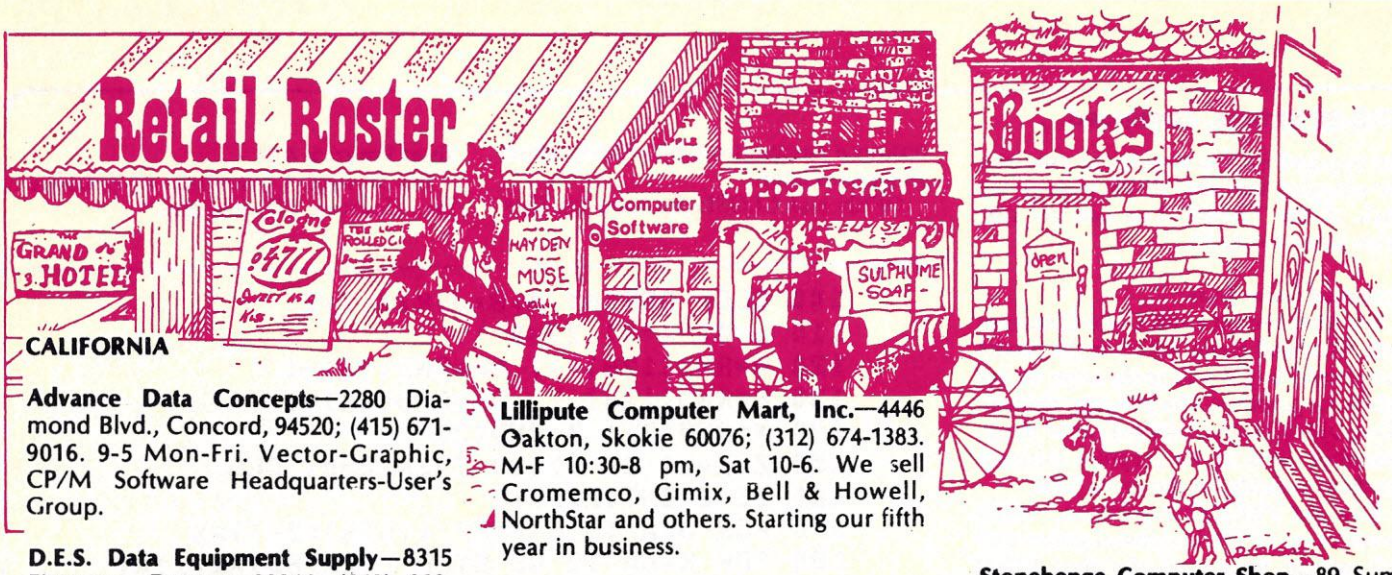

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the required DIN connector at one end, for plugging into the TAPE jack at the back of the TRS-80. You can get that cable alone for $5.95.

Extended Color Basic

For $599, you get a 16K Color Computer with Extended Basic, which is the model you should buy if you really want to get into color graphics. The 215-page manual, *Going Ahead with Extended Color Basic*, describes many of the graphics software goodies available for the extra $200.

You get PMODE resolution, which provides up to 256 horizontal points and 192 vertical, for a total of almost 50,000 points. At this high resolution, a straight line looks very much like a straight line.

Extended Basic provides some of the features found in Microsoft's Level III Basic, features that Radio Shack had to remove to squeeze what became Level II into 12K of ROM (see this column, April 1981, p. 188).

To draw a line, from top left to bottom right, enter

LINE (0,0)-(255,191),PSET

or, if you want a box to be drawn with those points at two of the corners, write

LINE(0,0)-(255,191),PSET,B

or if you want that box to be filled in rather than empty, change the B to BF.

Color is now available in both foreground and background.

COLOR 3,8

provides a blue foreground on an orange background.

Circles are drawn automatically, by specifying location and diameter:

CIRCLE(128,96),95

and lines can be sketched in a very simple manner in DRAW mode by using U for up, D for down, L for left, R for right, and other letters for lines at an angle and for scale factor.

Making music is simplified in Extended Basic, using MUSIC mode, which has a three-number entry that determines the note, its length, and its volume.

Neither manual gets into sound effects, which is too bad, because many games benefit greatly from sound, and not just musical sound.

Although 4K Color Basic has no editing capabilities, which means that to correct a program line, you have to rewrite it, 16K Extended Basic has these editing commands; change, delete, insert, search, and kill.

Extended Basic also permits you to use LET, if you feel you must; LET can't be used with 4K Color Basic.

RENUM is also included in Extended Basic, as are many others, such as SQR, TAN, ATN, LOG, EXP, FIX, DEF FN, PRINT USING, TRON, TROFF, and TIMER, which starts at power-up and returns a number from 0 to 63,535, about 18 minutes later.

OPEN and CLOSE are used for files, and EOF tests for end-of-file. Constants can be entered as either hex or octal: &HFF or &073. Or just plain &277.

Radio Shack is understood to have plans to make assembly-language programming available for the Color Computer.

Color Video Receiver

The TRS-80 Color Video Receiver listed at $399 in the catalog is Radio Shack's first TV set, made available for only one reason: the Color Computer.

The 13"-diagonal receiver is also, of course, usable as a standard television set, and performs very well as such. It has pushbutton tuning, a half-inch-high segmented channel-number display, and a channel memory: when you turn on the receiver, it's set to the channel you were using when you turned it off.

Actually, the Color Computer has an internal RF converter that allows you to connect the computer to any color TV set, or to a black-and-white set, for that matter.

According to the catalog, the television receiver provides "sharp color graphics and easy-to-read text." Well, yes, within the capabilities and limitations of the Super AccuLine picture tube. But for more easily read text, you're better off with the Model I, II or III TRS-80, or even the TRS-80 Pocket Computer.

The Color Computer comes with a separate *Operation Manual*, a 32-page booklet that shows and tells in detail how to install the TV set, connect and use a cassette recorder, plug in a ROM Program Pak, operate the computer, use joysticks, and also has a few pages on troubleshooting and maintenance. And it has an index, which it doesn't really need, although there's no index in the manual, which does need one.

Short Program #19

Bill Stewart, a consultant to Zoftware Inc., Houston, TX, sent this:

```
100 CLS: DEFINT A,B,J,K,X,Y,Z
110 J=0: K=0: ZZ=0
120 A=RND(128)-1: AA=RND(48)-1
130 B=RND(128)-1: BB=RND(48)-1
140 X=RND(3): Y=RND(2)
150 Z=Z+1: IF Z>100 THEN Z=0: CLS
160 ZZ=Z-INT(Z/2)*2
170 FOR J=A TO B STEP ((A>B)*2+1)*X
180 FOR K=AA TO BB STEP ((AA>BB)*2+1)*Y
190 ON ZZ GOTO 200: RESET(J,K): GOTO 210
200 SET(J,K)
210 NEXT K,J: GOTO 120
```

Figure 2.

"This deceptively simple little graphics program we wrote on a TRS-80 has kept all of us here at Zoftware Inc. mesmerized. All it does is alternately set and reset random-sized rectangles at random locations on the screen while randomly stepping the loops. The result is a very entertaining graphics display that many micro-nuts like us could watch happily for hours.

"So the next time your micro is sitting around looking bored, key in this little program and give it something creative to do. (Also note in lines 170-190 the undocumented functions we discovered.) Have fun!"

The program has been slightly rewritten to make it narrower:

There have been other short programs that draw random-sized rectangles at random locations. This one improves greatly on the basic idea by setting and resetting rectangles that are sometimes solid, sometimes made up of lines, and sometimes consisting of arrays of separate graphics blocks.

In fact, this is such an improvement that printouts or photos of the display could easily qualify as modern art.

A nice touch: after painting 100 rectangles, the canvas wipes itself clean with line 150, because by then the "painting" is something of a mishmash. If you want the cleaning done sooner, or even later, change the number. □

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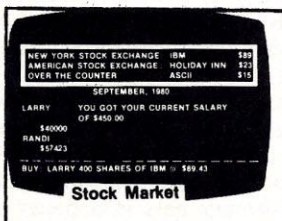
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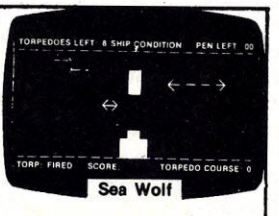

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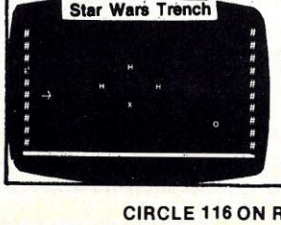

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CIRCLE 237 ON READER SERVICE CARD

software legal forum

Harold Novick

The comments and opinions of the author are given for educational purposes only and are not meant to be legal advice. Specific legal questions should be referred to your personal attorney.

Webster's Dictionary defines a "Forum" as "a public meeting place for open discussion"; and as "a medium of open discussion." The aims of the Biological Abstracts include "to act as a forum in which controversial issues . . . can be discussed." The purposes of Software Legal Forum are the same. This column will print all comments (made in good faith, of course) about any legal subject that relates to software. In addition, if the comments are long enough and of a good enough quality, and are not duplications of previous columns, then the writer will find himself or herself a guest author. Naturally, the guest author will be paid the regular column fee.

The April 1981 Software Legal Form mentioned a letter written by Barry Bayer and began a series of Forums on "protection of software customers." Following the April column, Mr. Bayer, himself a Chicago attorney, personal computerist, and Ham, wrote a letter to the Forum. Mr. Bayer raises some very important issues in his letter and expresses his views very well. He also makes an offer to the readers of the Forum to act as a clearinghouse for disgruntled software consumers. Following the purposes of the Forum, Mr. Bayer's letter is reprinted below (with his permission and with one editorial deletion made at his request):

Dear Mr. Novick:

I am pleased that my Letter to the Editor was able to give you some ideas for topics for future columns. You are right, of course. I have had very little in the way of legal problems involving my computer hobby. And most of the problems that I have had have been as a result of violating one or more of the three cardinal rules of purchasing:

1. Know your vendor;

2. If by mail order, use "plastic money";

3. If it is too good to be true, it probably is not true.

But I do not think that there are "legal" answers to the attitude of a vice president of one prominent software publisher who likened the sale of an expensive (for microcomputers, that is) piece of software, to the sale of a car. "If General Motors sells you a car and you get into an accident, you would not expect them to replace the car, would you? Why then, do you expect me to give you a new disk if you let your dog eat it?" This same gentlemen told me that there were ten known "bugs" in one of his very famous and best selling programs. As a registered owner of that program, however, I have gotten no information from the company as to the nature of these "bugs" nor the fixes for them, and no offer of recall.

What is needed here are attitude and behavior modifications. A magazine like *Creative* is in a rather strong position to do something about amoral vendors, if David Ahl decides to.

With respect to your further comments on my letter, however, I am interested in hearing from your readers who have had problems of poor support, or non-support, from software vendors, and hardware vendors, for that matter, and who feel that they have been legally disadvantaged.

I do not promise to answer anybody, although I will undertake to put correspondents in touch with each other, if similar complaints appear against the same vendor. I would use these letters, however, to do a column for you to illustrate the problems that people are having with software and hardware purveyors, with, perhaps, some educated suggestions as to what can be done to obtain a reasonable settlement.

You are free to publish my offer in your column, but please direct responses to my home address: 2842 Walnut Rd., Homewood, IL 60430.

I would be willing to make you a small wager that the publication would result in lots of material, and lots more columns. (Of course, you may have to change the name of your column to Consumer Protection Forum.)

Cordially,
Barry D. Bayer

A lengthy telephone conversation was then conducted with Mr. Bayer. Being an avid purchaser of software, Mr. Bayer felt very strongly about the situation in which software consumers find themselves. They must pay from $150 to $600 for good software. In most cases the software runs as advertised, but there is no provision for recalls, updating, or even notification of bugs that the vendor has discovered. All the consumer gets is a paper that disclaims every conceivable (and inconceivable) liability. The vendor, it seems, does not want to take written responsibility for anything, including correcting known errors.

One vendor, when questioned by Mr. Bayer, stated that he stands behind all his software and would be willing to provide corrections and even refund the purchase price to a dissatisfied purchaser. Yet this same vendor had a restriction in his early software license agreement that said the purchaser agreed to use the software only for business. Why? He responds that his lawyers told him to put the clause in the contract. However, presumably because of outside pressures, this clause was later dropped.

Last month's Forum concluded that there may not be any practical legal recourse for the software consumer because of the economic realities—litigation fees far exceed the cost of the product or recoverable damages. However, there may be a practical, non-legal solution. Most soft-

Harold Novick, Patent Attorney, Larson & Taylor, Arlington, VA 22202.

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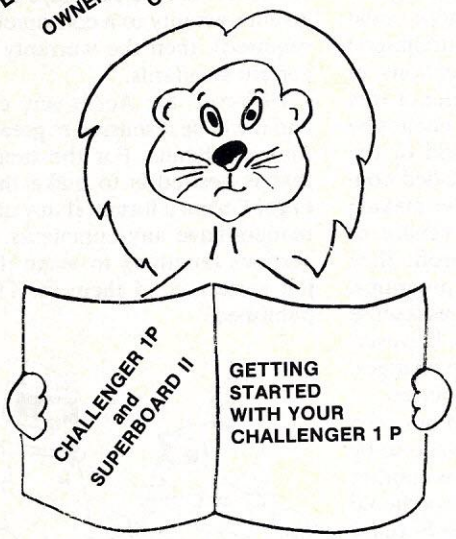

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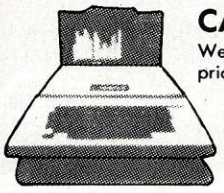

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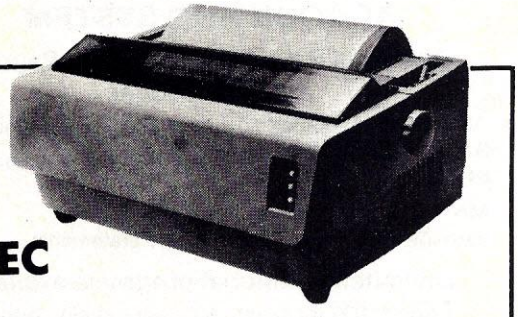

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Legal Forum, continued...

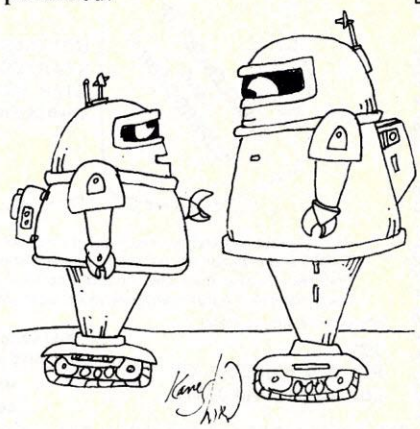
ware vendors have three common attributes. First and foremost they want to make a profit; secondly, they want to sell a good product; thirdly, they want to stand behind their product. Usually they back off of goals number two and three only when they jeopardize number one. On the other hand, if they can make a greater profit by producing a better product or by standing behind their product, then they will be all for it. The answer for the consumer on how to get more reliable software from more responsive vendors is to encourage a greater profit for those who meet the demands of the software consumer.

Mr. Bayer had a good idea. Establish a type of "Good Housekeeping Seal of Approval" for software. Why doesn't some major publication, such as *Creative Computing*, provide such a seal? Good question. Such a seal, however, must be the result of actual use, testing and approval (for example, by a readers' poll) and not just some advertising gimmick. Query: would the software consumer be willing to pay the extra cost?

Another idea is for the software users to band together to form a kind of "Software Consumers Union." There is strength in numbers. Perhaps such a union might be able to convince the vendors to provide, for a small extra charge of 5 to 10% (to increase profits!), a "free" update program. Under such a program, the vendor could agree to advise promptly all purchasers: of program bugs and their corrections; of free updates for a period of time; of free replacements if a program bug cannot be corrected by the consumer; and of the existence of refunds for dissatisfied consumers. If anyone questions the making of such a profit, just ask any vendor of household items how much profit they make from their "insurance" programs. Such a program makes good business sense to a business person. Sometimes, however, one has to use pressure to make changes, even if the changes are for the better.

The Automobile industry did not start its recall program until forced to do so by Federal legislation. Maybe this is another approach that software consumers should consider. As mentioned in earlier Forums, there is the Federally enacted "Magnuson-Moss Warranty Act." This act, which is a rather weak law, applies to all goods intended for use by consumers. If goods are intended for use in business, the act does not apply. Perhaps that was the purpose of the earlier mentioned vendor who required a statement that the software was not to be used for "personal computing." The Magnuson-Moss Warranty Act may apply to personal computing software. However, all the Act says is that if you give a warranty to a consumer (one is not required), then the warranty must meet certain standards.

However, the Act is very complicated and it will be discussed in greater detail in future columns. For the time being, all that is desired is to make the Software Legal Forum a forum. If any of the Forum readers have any comments, ideas, suggestions (anything to make this author's job easier), send them in. They will be published! □



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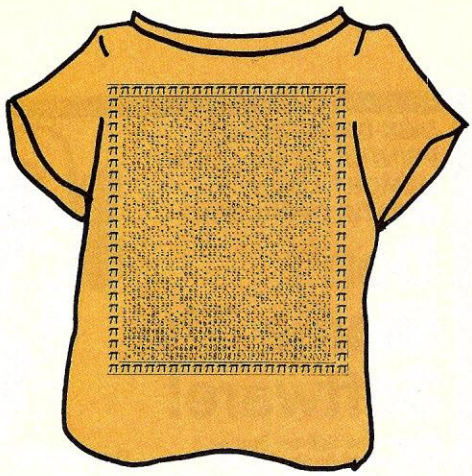

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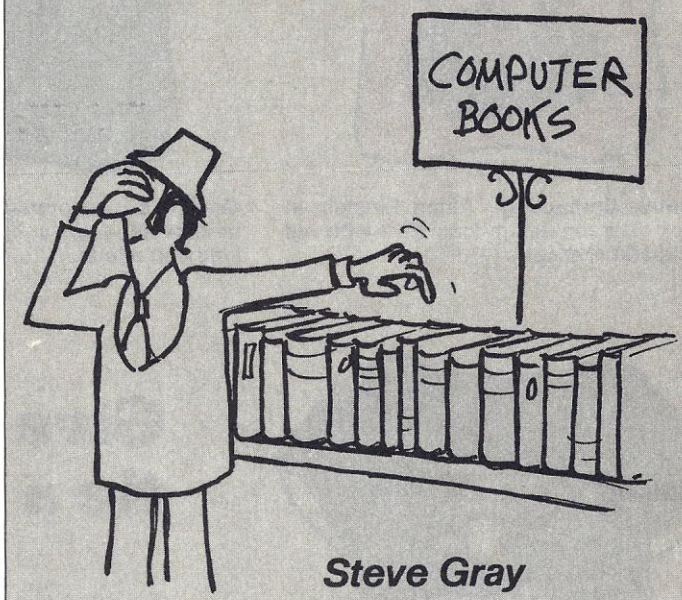

Steve Gray

Fifty Basic Exercises, by J.P. Lamotier. Sybex Inc., 2344 Sixth St., Berkeley, CA 94710. 247 pages, paperback $12.95. 1981.

Although seemingly a book of exercises, this translation from the French is designed to teach Basic, through the use of "completely explained exercises: statement and analysis of the problem, flowcharts, programs, and actual runs," according to the back cover.

The first exercise is on Computing Taxable Income, starting with a four-line program in Microsoft Basic, then enlarging it to an eight-line program.

Flowcharts are introduced in the second chapter, which by page 12 presents a fairly complex flowchart for finding the largest element of an array. However, the flowchart is quite well explained by several detailed pages.

And so the book goes, with chapters on Exercises Using Integers, Elementary Exercises in Geometry (area and perimeter of a triangle, plotting a curve, etc.), Exercises Involving Data Processing (Shell sort, day of the week, etc.), Mathematical Computations (synthetic division, calculating pi, etc.), Games (21 matchsticks, craps, etc.), Operations Research, Statistics (linear regression, etc.), Miscellaneous (signs of the zodiac, eight queen problem).

Two appendices provide the signs and symbols used in Basic, and the main syntax rules.

Although this book does teach many of the principles of Basic, and uses an interesting variety of exercises from many fields, the method of teaching inherently leaves out many of the fine (and not-so-fine) points usually covered in standard Basic texts.

However, among the very few books that teach Basic by this method, this is one of the very best, and can be recommended to those who want to learn a great deal about no-frills Basic. To those who are fairly bright, that is, because the book soon gets into programs that are rather complex for so early in the book, which is also rather heavy on the math.

The programs presented in the book are scheduled to be available on a cassette in TRS-80 format.

Programming in Basic for Personal Computers, by David L. Heiserman. Prentice-Hall Inc., New Jersey. 344 pages, hardcover $17.95, paperback $7.95. 1981.

The first four chapters present one of the slowest and most careful introductions to the basics of Basic available, with 96 pages devoted to PRINT, LET, RUN, END, INPUT, GOTO, and looping with IF/THEN and FOR/TO/NEXT.

Example after example is given, and discussed at great length. If you can't get past chapter 1, forget it, you'll never learn to program.

The remaining ten chapters get into formatting hints, programming shortcuts, ON/GOTO, RND, GOSUB/RETURN, subroutines, functions, logic operators, strings, READ/DATA, and arrays.

Even when discussing multidimensional arrays in the last chapter, the author explains everything in such detail that this is an ideal text for learning Basic by yourself.

Microsoft Basic is the "brand of Basic used throughout this book," as the author puts it, and follows that with a curious statement, "Radio Shack's TRS-80 uses Microsoft Basic, so that will be the convention established in this book."

Each chapter ends with exercises; answers to selected ones are at the back of the book. Many of the early exercises ask the reader to "describe how the computer will respond to the following statements" or "describe what the following program will do"—excellent progress checks.

Meant to be used hands-on with a personal computer, this is the book Radio Shack should have provided with the Level II TRS-80 instead of that all-too-brief reference manual.

The Micro Millenium, by Christopher Evans. Viking Press, New York. 255 pages, hardcover $10.95. 1979.

"This book is about the future. Not some distant future which we can blissfully ignore, but one which is imminent. It will involve a transformation of world society at all levels, and while taking place slowly at first, will gather pace with sudden force. It's a future which is largely molded by a single, startling development in technology. The piece of technology is, of course, the computer."

That's what the front of the dustcover says. The back gives several facts "About the Astounding Microprocessor," among which:

"If the efficiency and cheapness of the car had improved at the same rate as the computer's over the last two decades, a Rolls-Royce would cost about $3.00, would get three million miles to the gallon, and would deliver enough power to drive the QE2.

"Today a single silicon chip can store 10,000 words; very soon, it will be able to encompass an entire novel; by the end of the '80s, a whole set of books—and at a tenth of the production cost."

And so on. The text itself, published in England as "The Mighty Micro," is much less gee-whiz, and is quite interesting. Evans starts with the past (binary, Babbage, Zuse, ENIAC), goes on to the present (SAGE, Space Race, LSI), the short-term future: 1980-1981 (bubble memory, translating, computer games, computer modelling, the rise of Japan), the middle-term future: 1983-1990 (death of the printed word, decline of the professions, money and crime, work and robots, intelligent machines,) and the long-term future: 1991-2000 (machine intelligence, end of war?, rise of Third World, home entertainment, psychotherapy, energy sources, "bizarre issues"). One drawback: only one drawing, no photographs.

Evans covers a great deal of territory, both as to devices and philosophically, and is well worth reading, especially by those whose jobs depend upon computers and/or microprocessors.

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CIRCLE 105 ON READER SERVICE CARD

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Background Math for a Computer World, by Ruth Ashley. John Wiley & Sons, New York. 317 pages, paperback $7.95. Second edition, 1980.

This book, writen "in consultation" with Nancy B. Stern, "is for students with no college math and very limited high school mathematics who discover that they, too, are expected to be able to use computers."

It consists of "frames," each of which "includes a question to answer or a problem to solve and is followed by the correct answer or solution." So you slide a piece of paper or a card down the page, covering up the answer until you've written down your answer, then check the given answer.

Ashley starts with binary numbers, first reviewing decimal numbers in 19 frames that either have multiple-choice answers or a space to fill in a word or number.

After binary numbers, Ashley goes on to octal and hex numbers, Logic for Computers, Algorithms and Flowcharts, Computer Arithmetic and Notation, Angles and Trigonometric Functions, Interest and Mortgage Problems, Sequences and Series, Probability, Statistics, Linear Equations, Matrix Algebra, and Game Theory. Each chapter ends with a self-test, and the book ends with an 18-question final test and one-page tables of square roots and trig functions.

This particular style of teaching math, by asking questions, does not lend itself to the use of a number of illustrative examples for each point made, and thus the book would be difficult for any but a fairly bright student. After the 19 frames on decimal counting, for example, binary numbers are taught in only seven frames, binary counting in 15 more frames, and binary adding, subtracting and multiplication in only 19 more frames.

Each frame takes up a third to half a page, including wrong answers, so what is actually taught takes up only a fraction of each frame. However, the frame method does give the reader a sense of accomplishment and may be quite well suited to many.

The Cybernetic Imagination in Science Fiction, by Patricia S. Warrick. MIT Press, Cambridge, MA. 296 pages, hardcover $15. 1980.

"Warrick's surprising findings indicate that most science fiction writers since 1930 have been backward in their attitudes toward artificial intelligence and ill-informed about computer technology, lagging behind cybernetic developments instead of anticipating the future. Among the 225 short stories and novels the author surveyed, only a small minority regard computers as the next step in the evolution of intelligence in the universe. Most picture robots and computers as dehumanizing and destructive. Her book suggests that technology is growing too complex for the literary imagination to grapple with easily," according to the dust jacket.

Warrick, who claims her book is "the first . . . comprehensive bibliography on a single theme in SF," proposes a science-fiction aesthetic and applies it to recognized classics, with chapter sub-headings such as Early Automata, Isaac Asimov Develops the Genre, An Aesthetic of Complementary Perception, The Robot as Metaphor, Machine Intelligence as a Tool, Dystopian Literature, Genetic Information Codes, Man-Machine Symbiosis, and Philip K. Dick's Robots.

The book ends with two bibliographies: non-fiction (from *New Maps of Hell* to a physics textbook) and fiction dominated by Asimov and Dick).

Although some of the writing reads like a Ph.D. thesis, there is much here of interest to the serious SF enthusiast, with its many analyses of the classics; to computer people

who want to know how computers are treated in SF; and to anybody who wants to know how to write an exhaustive treatment of an interface between the English language and a leading wave of the future.

Computer Basics: An Easy Guide Book for Beginners, by Arnold I. Cohen. Mini Computer Analysis, Ltd., 40 East 34 St., Suite 419, New York, NY 10016. 168 pages, paperback $11.95 (plus shipping). 1979.

"This textbook on computer programming, using Basic, has been especially designed for teaching 5th-9th graders how to effectively use computers," according to the preface, which mentions a further limiting factor: the book refers constantly to the Northstar Horizon computer.

Apparently the book evolved from notes used by Cohen in teaching Basic programming, because someone probably felt it had commercial possibilities. Although there's a great deal of useful information in the book, and Cohen knows how to get complex ideas across without talking down to his audience, the book's audience is limited by being based on the Northstar computer and by its price, which undoubtedly could be lowered if the book were to be printed in quantity and without the perforations and plastic-strip binding that add considerably to cost and production time.

In 15 chapters that include subscripts, string variables, data files, sequential and random-access files, Cohen covers a lot of territory. He starts out slowly and easily, explaining every program line in detail, and includes exercises for practice work.

The text is enlivened by many relevant little drawings that depict the programmer as a large M&M with eyes and mouth, plus stick legs and arms, and show the computer as a smiling console.

Cohen teaches not only Basic and flowcharting, but gets into hardware, with a whole chapter on the subject, which is rare in books on Basic.

With the errors (such as the CHR$ function let's you PRINT...") corrected, the text typeset instead of typed, the illustrations drawn more carefully, the text made more universal by omitting the Northstar references, and the book bound, Cohen might just have a winner here, if he could find a publisher.

Conversational Basic: A Dialogue Approach to Programming, by Michael E. Mulcahy. CBI Publishing Co., 51 Sleeper St., Boston, MA 02210. 367 pages, paperback $9.95. 1980.

The "dialogue approach," according to the back cover, is "a unique student/teacher dialogue format that encourages the reader to think and learn as though actually participating in a programming class . . . using a classroom-like, question-and-answer approach."

The entire book consists of questions or comments by "students" whose names are Brian, Ann, Tim, Rita, etc., and answers or comments by an unnamed "teacher."

The first ten chapters introduce the fundamentals of Basic very gradually, the next eight chapters are supposed to "develop the programming skills already acquired," and the last eleven provide information on additional features of Basic.

But what makes this book unique is not the dialogue approach, or chapters numbered 000,010,020, etc., or the solutions to every problem at the end of each chapter, which, Mulcahy says, this text is the only one on Basic to provide (it isn't).

What makes this Basic text different from all the rest is Chapter 110, which presents machine-language programming via a "fictitious computer" that uses what the author has named DEMOL, "an acronym for decimal machine-oriented language." Only 10 operation codes are used in DEMOL, which simplifies the programming.

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All in all, this is a pretty good Basic text, with many examples, an interesting chapter on machine language, and lengthy explanations of difficult areas such as matrices, files and arrays.

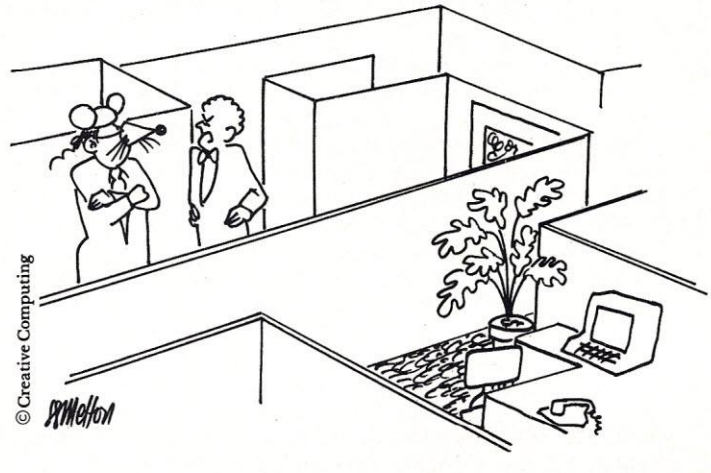
On the other side of the ledger are very wide left margins that make almost every page a third empty, and 60 pages of problem solutions that are half empty space which make for a rather large book. The designer must have a thing for white space.

Apple Machine Language, by Don Inman and Kurt Inman. Reston Publishing Co. Inc, Reston, VA 22090. 296 pp. $9.95.

This book is designed for the Apple owner who wants to learn the basics of machine language. Since there are several Apple configurations, the authors had to make a choice. They decided to slant the book toward those who have an Apple II with an Applesoft firmware card. Applesoft is necessary since the Basic programs used are in that language. Integer in ROM is required since the assembler and disassembler from the Integer ROM are used. Readers without the assembler will not be able to enter programs from the last section of the book.

The authors take a good approach to machine language. First, programs are POKEd in from Basic. Then a Basic Operating System is developed which eases program entry. Next, they move to the monitor, showing how to enter programs directly as hex code. Finally, they use the mini-assembler that comes with Integer Apples. Throughout the book, the instructions and explanations are clear. Many of the programs make use of existing subroutines from the Apple monitor. The book does not cover the entire 6502 instruction set, but provides enough background to get the beginner going.

There are only two problems with the book. There is an appendix which contains a list of commands and the pages where these commands are introduced. Unfortunately, the page numbers are missing from the column. Perhaps in the rush to get the book published, this slip occurred. The other problem is the way the authors use BMI (branch on minus) and BPL (branch on plus) to make jumps after comparisons. While the examples they use work properly, there are cases where this method is the wrong one to use. In general BCS (branch on carry set) and BCC (branch on carry clear) should be used when doing a branch after a comparison. Discounting this, the book is a great start for anyone wanting to program an Apple with machine language.—DL □



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3 ☐ 2 to 3 hours
4 ☐ 3 to 4 hours
5 ☐ 4 to 5 hours
6 ☐ over 5 hours

3 How many issues of *Creative Computing* do you usually read?

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2 ☐ Three out of four
3 ☐ Two out of four
4 ☐ One out of four

4 How many people read or look through your copy of *Creative Computing*?

Myself and ____ others.

5 Which personal computing periodicals do you regularly read or look through each month?

1 ☐ Creative Computing
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6 ☐ Do not retain

10 How many years have you been subscribing to *Creative Computing*?

_____ years

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11 What is your principal occupation?

1 ☐ Programmer/Analyst
2 ☐ Engineer/Scientist/Technician
3 ☐ Business Owner/Manager
4 ☐ Educator
5 ☐ Student
6 ☐ Professional (law, medicine, accounting, etc.)
7 ☐ Other

12 Do you use computers in your work? ☐ Yes ☐ No

13 If yes, with what frequency?

1 ☐ Daily
2 ☐ Weekly
3 ☐ Less frequent than weekly

14 If your company uses small computers, please check the statement that best describes your relation to your company's purchases.

1 ☐ I decide what to buy
2 ☐ I influence the buying decision
3 ☐ I am not involved

15 What is your exact title?

_____

Background

16 What is your age?

☐ under 20
☐ 20-24
☐ 25-29
☐ 30-34
☐ 35-39
☐ 40-44
☐ 45-49
☐ 50-54
☐ 55-59
☐ 60 and over

17 What is your sex? ☐ Male ☐ Female

18 Are you the head of a household? ☐ Yes ☐ No

19 How many people are there in your household?_____

20 What is your personal income from all sources?

1 ☐ under $10,000
2 ☐ $10,000-$14,999
3 ☐ $15,000-$19,999
4 ☐ $20,000-$24,999
5 ☐ $25,000-$29,999
6 ☐ $30,000-$39,000
7 ☐ $40,000-$49,999
8 ☐ $50,000-$74,999
9 ☐ $75,000-$99,999
0 ☐ $100,000 or more

21 What is your family income from all sources?

1 ☐ under $10,000
2 ☐ $10,000-$14,999
3 ☐ $15,000-$19,999
4 ☐ $20,000-$24,999
5 ☐ $25,000-$29,999
6 ☐ $30,000-$39,999
7 ☐ $40,000-$49,999
8 ☐ $50,000-$74,999
9 ☐ $75,000-$99,999
0 ☐ $100,000 or more

22 What level of education did you complete?

1 ☐ High school
2 ☐ Some college
3 ☐ Associates degree
4 ☐ 4 year college degree
5 ☐ Some graduate or professional
6 ☐ Masters degree
7 ☐ PhD
8 ☐ Professional degree (e.g. M.D., D.D.S., J.D., etc.)

23 Are you a member of a computer club? ☐ Yes ☐ No

24 Are you a member of a scientific, engineering, or computer professional society? ☐ Yes ☐ No

25 What is the approximate cost of any HiFi/Stereo equipment you own?

1 ☐ under $200
2 ☐ $201 to $500
3 ☐ $501 to $1000
4 ☐ $1001 to $2000
5 ☐ over $2000

26 Do you own a video recorder? ☐ Yes ☐ No

27 Do you own a video disc player? ☐ Yes ☐ No

28 What is the approximate cost of any photographic equipment you own?

1 ☐ under $200
2 ☐ $201 to $500
3 ☐ $500 to $1000
4 ☐ $1001 to $2000
5 ☐ over $2000

29 Have you purchased any consumer electronics products by mail in the past year from vendors such as JS&A, The Sharper Image, etc?

☐ Yes ☐ No

Microcomputing In Your Life

30 Which of the following best describes your involvement with personal computers?

1 ☐ Personal or hobby only
2 ☐ Professional or business
3 ☐ Personal and professional or business
4 ☐ Educational purposes
5 ☐ Research and development
6 ☐ Other

31 Please check any of the following ways you purchase equipment:

1 ☐ Local computer store
2 ☐ Direct from manufacturer
3 ☐ Systems house or OEM
4 ☐ Mail order
5 ☐ Club group purchase
6 ☐ Other

32 How many people in your household use a personal computer now? _____

33 How many additional people in your household do you eventually expect to use a personal computer?_____

34 What small computer do you own or use now?

1 ☐ Apple
2 ☐ Atari
3 ☐ Commodore
4 ☐ Cromemco
5 ☐ DEC
6 ☐ Exidy
7 ☐ Northstar
8 ☐ OSI
9 ☐ Radio Shack (TRS-80)
10 ☐ Sinclair or MicroAce
11 ☐ Texas Instruments
12 ☐ Other

35 What is the approximate cost of your personal computer system?

1 ☐ under $200
2 ☐ $201 to $500
3 ☐ $501 to $1000
4 ☐ $1001 to $2000
5 ☐ over $2000

36 Have you attended any computer fairs or shows in the past year?

☐ Yes ☐ No

37 Please note the brands of products you intend to buy in the next 12 months.

CPU _____
Printer _____
Plotter _____
Terminal _____
Tape or Disk _____
Memory _____
Modem _____
Graphics Pad _____
Synthesizer _____
Other peripheral _____
Software _____

38 What is the approximate cost of hardware (computers, peripherals, etc.) you plan to purchase within the next 12 months?

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39 What is the approximate cost for software you plan to purchase in the next 12 months?

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40 Please rank 1 to 6 the following sources of information about new products you intend to purchase.

1 ☐ Recommendation of friend(s)
2 ☐ Magazine article or review
3 ☐ Advertisement
4 ☐ Demonstration in store
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6 ☐ Other

Comments

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puzzle answers

Compute This Tune: If the first two notes are ping-ping, it will play pings forever. Any other pair of notes degenerates after three of four notes into boom-tweet-boom-tweet . . .

Another Train Problem: The distance between Anytown and New York City has to be 200 miles. That's a long commute! For the first hour the train went 50 m.p.h. After the breakdown it went 150 miles at 30 m.p.h. In the case of the breakdown happening 50 miles closer to New York City the train would have travelled 100 miles at 50 m.p.h. and 100 miles at 30 m.p.h.

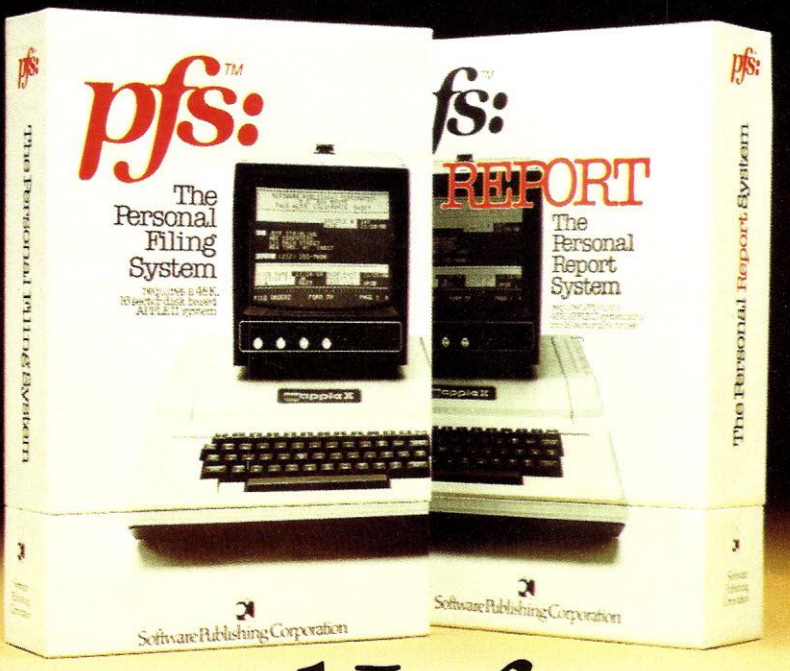
For The Birds:

Grandfather — Bedroom — Cockatoo — Cleo
Husband — Parlor — Parakeet — Hamlet
Wife — Porch — Canary — Beano
Son — Den — Parrot — Polly
Daughter — Kitchen — Mynah — Mungo

Dan The Duffer: The two shots that Dashing Dan plays are a 150 yard drive and 125 yard approach shot. The holes are made in the following manner: (1) 150 yards: 1 drive. (2) 300 yards: 2 drives. (3) 250 yards: 2 approaches. (4) 325 yards: 3 drives, 1 approach back. (5) 275 yards: 1 drive, 1 approach. (6) 350 yards; 4 approaches, 1 drive back. (7) 225 yards: 3 approaches, 1 drive back. (8) 400 yards: 1 drive, 2 approaches. (9) 425 yards: 2 drives, 1 approach.

A Ship Wreck Puzzle: The arrangement was as shown, the white spots representing the passengers, and the black spots the captain and his crew. The counting begins with the man marked **A.**

The *pfs*™: software series



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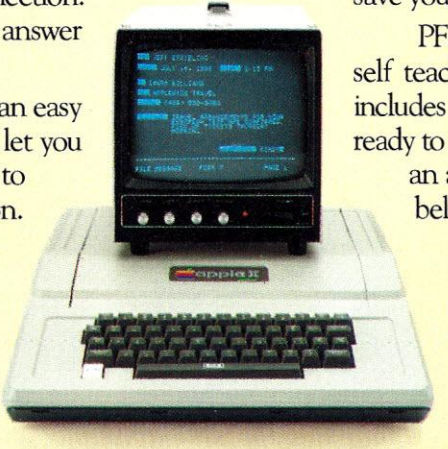

*requires a 48K, 16-sector disk based APPLE II system

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